TROPICAL DISEASES BUREAU.

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BABESIASIS.

(265) MAURITIUS. **Bovine Piroplasmosis in Mauritius.**—*Annual Report on the Bacteriological Laboratory for the Year* 1911. 1912. Port Louis: Printed at the Government Printing Office. pp. 15-16. With 1 plate.

Piroplasma bigeminum was seen for the first time in Mauritius in a cow that was infected with *P. mutans* and trypanosomiasis. The cow was three years old and owing to the *mutans* infection it was removed to the laboratory for inoculation experiments. While there, a parasite was observed in its blood that presented all the appearances of *P. bigeminum*. While under observation the animal passed blood-stained urine on a number of occasions. A calf was successfully inoculated from this animal.

(266) SYMONS (T. H.) & PATTON (W. S.). **Report on an Outbreak of Canine Piroplasmosis due to *Piroplasma gibsoni* (Patton) among the Hounds of the Madras Hunt, together with some Observations on the Treatment of the Disease with Salvarsan.**—*Ann. Trop. Med. & Parasit.* 1912. Oct. 18. Vol. 6. No. 3. B. pp. 361-370. With 5 charts.

Repeated attempts to transmit the disease from jackals to dogs by means of *Haemaphysalis bispinosa* have failed, and opportunity has not yet offered to try transmission experiments with another tick which is fairly common on the jackal and which according to NEUMANN is a new species allied to *Rhipicephalus simus*.

The pack comprised twenty-one couple and when the outbreak was diagnosed 15½ couple were found to be infected. The disease is a very acute one, and among the lesions produced is very great enlargement of the spleen. No haemoglobinuria was observed in any case although there was marked anaemia.

Intramuscular injections of salvarsan in doses of 0·6 gram were given and a single injection sufficed to effect a cure in the great majority of cases. Some of the hounds apparently received the treatment too late, and one or two died from complications.

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(267) Nawrotzky (N. N.). **Zur Piroplasmoseinfektion der Hunde durch die Schleimhaut des Magen-Darmtraktes.** [Infection of the Dog with Piroplasmosis by Way of the Mucous Membrane of the Alimentary Tract.]—*Centralbl. f. Bakt.* 1. Abt., Orig. 1912. Oct. 12. Vol. 66. No. 5-6. pp. 417-420.

The fact that a number of observers have suggested or have shown that certain trypanosomes can be transmitted experimentally by way of the intact mucous membrane of the alimentary tract prompted the author to investigate the same question with regard to piroplasms. He states that while it is well known that certain ticks are responsible for the transmission of piroplasms to horses, cattle, and sheep, the method of transmission to the dog is quite unknown, although it has been suggested that *Haemaphysalis leachi* and *Ixodes ricinus* may be responsible.

The author carried out experiments in which the organs of infected dogs were used for the feeding of experimental animals, but fearing that accidental wounds and abrasions in the mouth might afford a means of entrance of the parasite he subsequently restricted his experiments to the administration of blood containing piroplasms, the blood being either given by the mouth, or introduced directly into the stomach by means of a tube.

From a table given it is seen that three full-grown dogs and five puppies were used in the experiments with blood. The blood was diluted with either citrate or salt solution and introduced directly into the stomach. Infection followed in every case. Piroplasms were found in the blood of the puppies on the 2nd, 3rd, 6th, and 7th days after the administration of the blood, and in the case of the dogs on the 5th, 6th, and 7th days respectively. All the puppies and one of the dogs died. It is stated that the symptoms presented by the dogs did not differ from those observed after intraperitoneal inoculation.

(268) Branford (R.). **Trypanblau in the Treatment of Canine Piroplasmosis as occurring in India.**—*Veterinary Jl.* 1912. Nov. Vol. 68. No. 449. pp. 643-646.

According to the author canine piroplasmosis is a difficult condition to deal with in India owing to the following facts:

1. There is evidence to show that there are two distinct varieties of piroplasms, one of which is very resistant to trypanblau.

2. Pariah dogs in many cases possess a high if not a complete degree of immunity.

3. The great variety of types of dogs makes it difficult to say whether recovery has been due to treatment or natural resistance.

The dye was injected in 1 per cent. solution in normal salt solution subcutaneously, and the dose varied from 1 cc. to 10 cc. per pound body weight. The author found that within these limits the size of the dose did not appear to be of much importance, for if 1 cc. per pound did not cure 10 cc. would not.

In all, fourteen cases were treated. There were two deaths, eleven recoveries, and one case in which the result was classed as doubtful.

BRITISH MUSEUM

THEILERIASIS.

(269) Wölfel (K.). **Ueber den derzeitigen Stand der Impfung gegen das Küstenfieber.** [Immunisation against East Coast Fever.] —*Zeitschr. f. Infektionskrankh. Parasit. Krankht. u. Hygiene d. Haust.* 1912. Vol. 12. No. 3. pp. 247-255.

Theiler's successes in transmitting East Coast fever, with the resulting immunity, induced him to attempt to discover some method by which animals might be vaccinated against the disease. He had observed that the disease could only be successfully transmitted by the inoculation of pieces of tissue and consequently directed his efforts to discovering to what extent the reduction in size of the pieces might be carried without vitiating the result. In order to cause embolism in the internal organs, from which he expected to get the same results as from the implantation of larger pieces of tissue, he added peptone or aleuronate to the minced tissues.

By these experiments it was shown that the safest method of inoculation was the intra-jugular injection of a mixture of coarsely minced spleen or lymphatic gland and peptone.

One hundred and thirty-six animals were so treated. Of these ten died of intercurrent diseases, thirty-eight as a result of the inoculation and twenty-one died of the disease when they were being tested as to their immunity.

Experiments were then made on a larger scale.

In infected herds the animals showing clinical symptoms were separated and examinations made for the presence of Koch's granules. If these were discovered the animals were killed and the spleen and peripheral lymphatic glands were removed with aseptic precautions.

These were minced in a machine provided with a disc having perforations about 4 mm. in diameter.

The mince thus obtained was mixed with peptone until the mixture had the consistency of "jam." If on examination it was found that there were no bacteria in the mixture, but that plasma bodies were present in large numbers, the material was used for inoculation, the dose for a full-grown animal being 5 cc. and for a calf 2-4 cc. The inoculations were made into the jugular vein.

Deaths due to embolism of the lungs or heart were very rare.

The resulting reactions varied in intensity and as a rule differed from reactions caused by tick infection.

In the latter case the temperature usually rises about the 13th day and remains elevated for 6-8 days. This is followed by a remission and a second rise, the temperature falling rapidly just before death.

Reactions resulting from the inoculation of either spleen or gland pulp may be divided into typical and atypical reactions.

In the case of typical reactions the temperature curve resembles that given by reactions due to tick-infection. There is a rise on the 13-14th day followed by a remission and a second rise. The first rise of temperature is generally of shorter duration than in the case of tick-infection.

In atypical reactions there is no remission. The febrile attack lasts from 1-4 days, seldom longer. In many cases the temperature curves show several small oscillations at irregular intervals. There are also slight reactions in which the evening temperature remains below 40° C.

In animals that react typically Koch's granules can always be found, while in the atypical cases they are frequently absent.

Death is a frequent sequel to the typical reactions and to those in which the febrile attack persists for more than four days.

In such cases Koch's granules make their appearance in a manner exactly resembling that observed in tick infections. Agamonts are to be found in smears from the spleen or lymphatic glands at or shortly after the onset of fever. Shortly after this dividing forms and gamonts are found. One or more days after the appearance of the granules in the glands *Theileria parva* is to be found in the blood. The number of parasites in the glands, spleen and blood increases up to the time of death.

Koch's granules are generally demonstrable in the atypical reactions. In some cases the granules stain faintly and the nuclei appear vacuolated. Parasites of this kind may be present either alone or together with typical forms and as a rule are demonstrable for a short time only. The author suggests that they may be degeneration forms which are associated with the developing immunity.

If the inoculated animals be subjected to tick infestation after an interval, there is in many cases no reaction or a very brief one during the course of which Koch's granules are not discoverable. In other cases there may be febrile attacks associated with a transitory appearance of Koch's granules. These reactions may also be typical or atypical. It sometimes happens that in spite of the antecedent inoculation parasites appear in the glands (agamonts, dividing forms and gamonts) and *Theileria parva* in the blood.

The variations observed in these reactions must in part be due to variations of the virulence and number of the infective ticks, and in part to the degree of immunity acquired.

The degree of immunity established is not always proportional to the severity of the reaction produced. As a rule a reaction associated with the appearance of Koch's granules confers a high degree of immunity.

On the other hand it has occasionally happened that a weak atypical reaction with the complete absence of granules has been followed by a high degree of immunity.

In practice 343 animals that were certainly not immune have been inoculated. Of these 180 died as a result of the inoculation and 5 died subsequently as a result of natural infection, the remainder (46 per cent.) acquiring immunity.

A further batch of animals numbering about two thousand have also been inoculated and with more satisfactory results, but accurate conclusions cannot be drawn as to the value of the method from this series of inoculations since the inclusion of immune animals cannot with certainty be excluded.

At present the question of the application of the method in healthy districts and to imported animals has not been investigated.

(270) Swaziland. **Report on the Incidence of East Coast Fever Disease amongst Cattle in Swaziland.** [Elder (W. A.), Govern. Veterinary Officer.] (MS. Report dated Oct. 22, 1912.)

The disease first appeared in the Territory in 1902, and in a short time obtained a hold over a large portion of the country. At first a great deal of opposition was encountered on the part of the Swazis, but this was gradually overcome and their co-operation in preventive measures obtained.

In 1909 the following measures for the control of the disease were suggested:—

a. The branding of all cattle in the country, in order to facilitate the tracing of illicit movements of cattle.

b. The formation of concentration camps for infected herds.

c. The slaughter of calves of immune parents in infected areas.

d. The erection of a fence between the infected and the clean portion of the country.

a. Branding was successfully carried out after some opposition, and has proved of value.

b. The formation of concentration camps was not very satisfactory.

c. The slaughter of calves was only carried out in those areas in which immune animals were grazing on ground that was still infected. A period of fifteen months was allowed to elapse between the last death and the declaration that the land was free from infection.

d. A fence was erected running from the Komati River to the Usutu River, a distance of about seventy miles. This fence to a great extent served its purpose of preventing cattle straying from infected to clean ground and *vice versâ*.

After branding a grazing ground is appointed for each herd, and thus, in the event of an outbreak, the infected land can be localised.

With the discovery of a reliable dip which could be used at short intervals it was deemed necessary to adopt the dipping of cattle.

The necessary funds having been raised the following measures were undertaken by the Government:—

1. Slaughter of all infected herds, or as many of each herd as was deemed necessary.

2. Full compensation for slaughter or deaths from the disease after control of the herd had been assumed.

3. Isolation of infected ground for two years.

4. Slaughter of all cattle moved without permit without compensation.

5. The building of as many dips as possible in clean and infected country, and the adoption, as far as possible, of compulsory dipping.

The results are given for the first dipping tank erected, and from them the following facts are gathered.

During a period of fifteen months 1,204 cattle were dipped, and the number of deaths occurring at the dip was 311. The percentage of deaths was 25·83 as opposed to the usual percentage of 95 in infected herds. The animals were dipped every fifth day from March to September, and every third day from September to May.

All the herds taken to the tank were infected herds, and were grazing on infected land for the whole fifteen months. The majority of deaths were due to infection prior to the animals being brought to the tank. None of the animals shewed any ill effects from the continued dipping at short intervals. The dip used contained arsenite of soda, soft soap, and paraffin.

There were sixteen tanks in operation at the time of writing and four more were to be added during the year.

By means of the continual dipping, in which it is hoped to include horses, mules, donkeys, goats, and native sheep, a complete eradication of all tick transmitted diseases is looked for.

It is shewn that a great financial saving has been effected by the adoption of the compulsory dipping.

TRYPANOSOMIASIS.

(271) Rodhain (J.), Pons (C.), Vandenbranden (J.), & Bequaert (J.). **Note sur les Trypanoses Animales du Haut-Katanga.** [Note on the Animal Trypanosomiases in Upper Katanga.]—*Bull. Soc. Path. Exot.* 1912. Dec. Vol. 5. No. 10. pp. 819-822.

In examining the blood of a number of animals introduced from Rhodesia, including mules, donkeys, oxen, pigs, goats, sheep, and dogs, the authors have encountered *T. brucei*, *congolense*, and *cazalboui*.

In both mules and dogs infected with *T. brucei* (or *pecaudi*) they have found forms in which the nucleus was displaced towards the posterior extremity of the body.

In a puppy inoculated with the blood of one of the mules long, slender parasites with a free flagellum appeared in the blood on the fifth day after inoculation, but when the animal died a fortnight later short thick forms were numerous, and in 4·67 per cent. of these there was posterior displacement of the nucleus. In view of the fact that up to the time of writing no case of human trypanosomiasis had been recorded in Elisabethville, where the examinations were made, the authors feel certain that the trypanosome found was of the *brucei-pecaudi* group, and not the *rhodesiense*.

On the high plateaux in Southern Katanga where only *Glossina morsitans* is found this fly transmits the same animal trypanosomes as in the lower country in the northern part of the Province.

(272) Rodhain (J.), Pons (C.), Vandenbranden (J.), & Bequaert (J.).—**Les Trypanoses Animales au Bas-Katanga et leur Rapport avec les Glossines (3e Note).**—*Trypanosoma denysi* **(n. sp.) Parasite de l'Ecureuil Volant.** [Animal Trypanosomiases of Bas-Katanga and their Relationship to the Glossinae (3rd Note).—*Trypanosoma denysi* (n. sp.). A Parasite of the Flying Squirrel.]—*Bull. Soc. Path. Exot.* 1912. Oct. Vol. 5. No. 8. pp. 608-611.

In a previous communication (see this *Bulletin*, Vol. 1, No. 1, p. 40) the authors record the occurrence of trypanosomes of the *cazalboui* and *congolense* types, and the part play by *G. morsitans* in their transmission. In the present note they record the discovery of the *T. brucei* (or *pecaudi*) and give details of experiments in which it was successfully transmitted by *G. morsitans* bred in the laboratory.

A description is added of a new flagellate found in the blood of a flying squirrel.

T. brucei has been found in the blood of a dog, which was at the same time host of *T. congolense*, and also in the blood of a goat.

A guinea-pig inoculated from the dog became the subject of a double infection. Female *morsitans* which were kept in the laboratory for the breeding of pupae were fed on the goat. A large number of the flies became infected and these transmitted the infection to a guinea-pig and two monkeys.

In a single experiment with flies bred from laboratory pupae a positive result was obtained.

Two of the flies from the batch were found on dissection to have a heavy intestinal infection, and in one of them multiplication was commencing in the proboscis. The fly which had successfully transmitted the infection was found to have parasites in the whole of its intestine and in its proboscis.

From the results obtained the authors calculate that 4·16 per cent. of the flies are infective.

Trypanosoma denysi in the fresh state executes active movements which do not involve much translation. One can also make out that the posterior end is drawn out into a point, and that there is a free portion to the flagellum.

In preparations fixed with osmic acid and stained with Laveran-Borrel the trypanosome was found to measure 37-48 microns, and the free portion of the flagellum 8-10 microns.

The width of the body opposite the nucleus is 2-4 microns. Anteriorly the body becomes wider, and posteriorly it is drawn out into a point. The cytoplasm stains uniformly pale blue, and no metachromatic granules or vacuoles are present.

The nucleus is oval and lies in the long axis of the body. It is situated in the anterior portion of the body and does not show a distinct caryosome.

The blepharoplast which is situated about 7 microns from the posterior end of the parasite is large and rounded. The flagellum is thick.

A flying squirrel was under observation for three days during which time the parasites were constantly present in its blood but not in very large numbers.

(273) Archibald (R. G.). **A Trypanosome of Cattle in the Southern Sudan.**—*Jl. Comp. Path. & Therapeut.* 1912. Dec. Vol. 25. No. 4. pp. 292-297. With 1 text-figure.

The trypanosome was originally derived from a cow brought from the Mongalla Province to Khartoum.

In the living state the organism showed very active movements, not associated with any marked translation, and it had a tendency to adhere to the red corpuscles.

The stained preparations were made by fixing moist films with osmic acid and staining either with Leishman or Giemsa.

The parasite measured from 9 to 20 microns in length, and was found to be somewhat short and stout in form. Very squat and tadpole forms were met with, and particularly in films in which the parasites were numerous. The posterior extremity was, in most cases, blunt and rounded. The membrane was fairly well developed, and was as a rule somewhat narrow and straight. There appeared to be no free flagellum, and this structure arose at a point quite close to the micro-nucleus.

The average breadth of the trypanosome, including the membrane, was 1·4 microns.

The majority of the organisms showed a number of chromatin-staining granules posterior to the nucleus, and this was particularly the case in the longer forms. Some, however, showed granules anterior to the nucleus, and vacuoles, when present, were found in the same portion of the body.

The micro-nucleus was terminal or nearly so.

Experiments showed that the trypanosome was pathogenic for the following animals: ox, mule, monkey, goat, sheep, rabbit, donkey, dog, gerbil, and jerboa. The guinea-pig was found to have a relative immunity.

The symptoms and lesions were those usually associated with trypanosome infections. In some animals the trypanosomes steadily increased in numbers up to the time of death. In the goat there was a certain periodicity, and the trypanosomes were usually small and very uniform in length.

No experiments could be undertaken to ascertain the agent concerned in the transmission of the parasite owing to lack of material, but from the history of the original animal the possibility of tsetses acting as the carriers could be excluded. Either Stomoxys or Tabanidae may have been the transmitting agent.

The trypanosome could be cultivated fairly readily on blood agar. At the end of forty-eight hours numerous clumps of active trypanosomes with their flagellar ends directed outwards could be seen. Stumpy and plasmodial forms which were found after twenty-four hours were less numerously present a day later. After seventy-two hours, numerous long forms were present, many of which were vacuolated and contained granules. The trypanosomes lost their vitality after the fifth day.

The author concludes that the trypanosome is the *T. pecorum*.

(274) Bettencourt (A.) & Borges (I.). **Présence de Trypanosomes dans le Sang des Bovidés Portugais.** [Trypanosomes in the Blood of Portuguese Cattle.]—*Bull. Soc. Path. Exot.* 1912. Oct. Vol. 5. No. 8. pp. 603-604; & Nov. No. 9. p. 725.

After having examined the blood of eighty animals by the cultural method with negative results, the authors discovered three animals out of a batch of eleven having trypanosomes in their blood. The forms of the trypanosomes as they appeared in the authors' cultures corresponded exactly with those described by other authors, crithidial forms being prominent. The organisms made their appearance in the cultures two days after being sown and persisted for fifteen days or more. In stained preparations, and particularly from cultures of moderate age, the parasites stained deeply and showed large numbers of granules in their cytoplasm. Forms in the process of longitudinal division were encountered in many cases, particularly about the seventh day of growth. Rounded flagellate forms were very rare. Absolutely typical trypanosome forms have been met with somewhat rarely in cultures from seven to eight days old.

In some of these forms the blepharoplast, although posterior in position, was close to or touching the nucleus, but in other specimens the two bodies were at some distance from each other, the blepharoplast being in the posterior third of the parasite, and the nucleus at the junction of the anterior and middle thirds. The parasite possesses an obvious undulating membrane. The authors have not been able to discover parasites enclosed in leucocytes as described by Behn.

The authors have not been able to find flagellates in the blood of 23 animals from the Azores and they suggest the possibility that the intermediate invertebrate host may not occur in those islands.

(275) Mitzmain (M. F.). **The Transmission of Surra in the Philippines.** [MS. letter.]

In a private communication the author states that he has succeeded in transmitting surra by means of *Tabanus striatus*, the common horse-fly of the Philippines. The experiments were performed with bred flies by the direct method from guinea-pig to monkey and from horse to horse. He states that this fly is undoubtedly the carrier of surra in extensive outbreaks in the Philippines. There exists a decided correlation between the predominance of the fly and outbreaks of surra.

(276) Duke (H. L.). **A Camel Trypanosome, with some Remarks on the Biometric Method of Diagnosing Trypanosomes.**—*Proc. Roy. Soc.* 1912. Oct. 31. Series B. Vol. 85. No. B 583. pp. 563-568.

The trypanosome here described was originally derived from a camel from Boran, and the experiments were undertaken to see whether the trypanosome was transmissible by laboratory-bred *G. palpalis*; a few sub-inoculations were performed.

Morphology.—Measurement of 400 trypanosomes taken at random shewed that the length varied from 18 to 34 microns.

The great majority of the parasites were slender, but a few broad forms were seen. The flagellar [? aflagellar] end was in some cases very drawn out, and the kinetonucleus from 4 to 5 microns from this extremity. The undulating membrane was well developed.

The kinetonucleus was well developed but small, rounded in shape, and variable in situation from the extreme end of the parasite up to 4-5 microns from the posterior end.

The nucleus was situated near the middle of the body.

A number of fly transmission experiments were carried out but in no case was a successful transmission obtained, and no trypanosomes were found in the flies used, either in the proboscis or the gut.

Many of the sub-inoculations into other species recorded in the paper were carried out by MONTGOMERY from whom the trypanosome was obtained.

In an ox the disease lasted 112 days, trypanosomes were never observed in the peripheral blood, but infection was proved by sub-inoculation.

In a mule, in one instance the period of incubation was five days. The animal was alive 130 days later, and the trypanosome could not be seen in the blood by direct observation.

In a second mule the only detail given is that the duration of the disease was 136 days.

In two donkeys the period of incubation was eight days, and the duration of the disease 99 and 128 days.

In dogs the period of incubation varied from 7 to 11 days, and the duration of the disease from 21 to 68 days.

In monkeys, rats, and guinea-pigs the period of incubation was four days. The duration of the disease in the rats was 10 days, and in the guinea-pigs about 70.

Identity of the trypanosome.—According to the author the diagnosis appears to rest between *T. brucei*, *evansi*, *equiperdum*, and *equinum*. The presence of a well-marked centrosome and the absence of any plaques excludes the latter two. A curve is given which the author has constructed upon the measurements of 100 parasites from each of four experimental animals, and the curve is said to correspond roughly with BRUCE'S curve for *T. evansi*. The absence of short stumpy forms from all the experimental animals is against *T. brucei*.

The animal experiments, although not typical of *T. evansi*, suggest this parasite rather than *T. brucei*, and this conclusion is supported by the evidence furnished by the morphology.

With regard to the biometric method of recognising trypanosomes the author points out that, while in some cases it is of value, its value is in some danger of being over-estimated. To obtain an accurate conception of the dimensions of any trypanosome all stages must be followed out from the commencement to the conclusion, slides taken haphazard being useless. The minute exactness of measurement insisted upon by some authors is held to be irrelevant as regards the practical value of the method.

Other factors which render the biometric method inconstant are:

1. Fixation will vary in different parts of the same slide and in the preparation of slides by different observers.
2. Numerous varieties of strain exist among trypanosomes of any species.
3. The great similarity between many so-called species as regards their length variation.
4. Probably continued maintenance in laboratory animals leads to slight alterations in the morphology of a strain, which to be kept true should be passed from time to time through the insect host.

(277) Kinghorn (A.) & Yorke (W.). **Further Observations on the Trypanosomes of Game and Domestic Stock in North Eastern Rhodesia.**—*Ann. Trop. Med. & Parasit.* 1912. Dec. 30. Vol. 6. No. 4. pp. 483-493.

This report contains the results obtained from the examination of the game, stock, and small vermin during the whole period spent by the authors in Rhodesia. In an earlier report (see this *Bulletin*, Vol. 1, No. 2, Ref. No. 124) the various trypanosomes found in game and domestic animals in the vicinity of Nawalia in the Luangwa Valley were described. In this abstract the results obtained at Ngoa, to which place the headquarters of the Commission were moved at the end of April 1912, are given. The routine method of examination was that described in the previous report.

At Ngoa, 124 wild animals belonging to 16 genera were examined, and trypanosomes found in 21—a percentage of 16·9. Trypanosomes were found in the peripheral circulation of bucks in 16 instances, but it is probable that had several preparations been made from each buck the percentage of successes would have been higher. In several instances only a single trypanosome was found after prolonged search.

Considering only the animals from which inoculations were made it is found that 23·3 per cent. of the local fauna were affected with trypanosomes. The percentage of big game infected with *T. rhodesiense* at Ngoa was 3·3, while at Nawalia it was 16. Both *T. vivax* and *T. nanum* have been found in game, but no inoculations could be made as susceptible animals were not available for the purpose. Had such animals been available, probably a higher number would have been found to be infected.

It would appear that different species of buck differ widely in their susceptibility. Amongst certain common varieties trypanosomes were never found, or only rarely. Waterbuck, eland, bushbuck, and kudu were the species found to be the most heavily infected.

To a certain extent these differences may be accounted for by the habitats affected by the various species, but specific differences in immunity are probably of much greater importance.

A table is given shewing the species of trypanosomes occurring in each animal in which parasites were found, the information

obtained from the results of inoculation being utilised in the compilation of the table, thus rendering the differentiation of *T. pecorum* and *T. nanum* possible. Double infections were found to be not uncommon. The fact that buck have steadily increased in numbers since rinderpest swept through the country would appear to indicate that their tolerance to trypanosomes is very great.

From the table it may be gathered that among the twelve waterbuck examined by either method *T. vivax* alone was found in nine instances, the same trypanosome along with *T. rhodesiense* was found in two cases, and with *T. pecorum* in one. *T. pecorum* was found in four eland and one roan. *T. vivax* occurred in one puku and one duiker, another duiker shewing *T. pecorum* or *nanum*. In a sitatunga *T. ingens*(?) was found.

At Ngoa three goats were examined. *T. nanum* or *pecorum* was found in one, *T. vivax* and *nanum* or *pecorum* in the second, and *T. vivax* and *pecorum* in the third.

The suggestion that small vermin might act as reservoirs for trypanosomes was tested by examining at Nawalia and Ngoa 142 wild rats, 15 wild mice, 1 wild rabbit, 1 giant rat, 1 squirrel, 1 galago, and 2 genet. The results were uniformly negative. It is pointed out that many small vermin in Tropical Africa are nocturnal in their habits and are not, therefore, subject to the bites of *G. morsitans*. Two hundred and fifty-six monkeys (*Cercopithecus pygerythus*) were examined with negative results.

(278) Mauritius. **Surra in Mauritius.**—*Annual Report on the Bacteriological Laboratory for the Year* 1911. 1912. Port Louis: Printed at the Government Printing Office. pp. 7-14.

The treatment of this disease in bovidae and equidae followed the lines laid down by Holmes, and in the case of the former gratifying results were obtained. In four herds numbering 181 animals there had been 23 deaths during the three weeks before treatment was commenced, but after the inauguration of the treatment no deaths were recorded. The method of treatment adopted was as follows:—One subcutaneous injection with soamin (2 to 5 g. in 5 per cent. solution) followed by the administration of 10 doses (1 to 3 g.) of arsenious acid in bolus on alternate days.

The results obtained with the equidae were not so good as those obtained by Holmes, but were encouraging.

It is stated that the success of the arsenic treatment of surra depends upon the strict observation of certain rules which may be summarised as follows:—

The arsenic should be administered in full sub-toxic doses. Should relapses occur the system of dosage should be changed and a dose of soamin administered to clear the circulation before the arsenic is recommended. For animals in advanced stages of the disease treatment should consist of injections of soamin at intervals of three or four days until the animals are in a condition to stand treatment with arsenic. The blood should be examined daily, and after treatment an animal should be kept under observation for two or three months, and a control dog inoculated with blood.

(279) Dodd (S.). *Trypanosoma ingens* **in the Mouse Deer** (*Tragulus javanicus*).—*Jl. Comp. Path. & Therapeut.* 1912 Dec. Vol. 25. No. 4. pp. 281-285. With 1 plate.

The parasite was discovered in three animals brought from Java to Sydney, two of which died within a few weeks of capture, and the other within eight months. All three were affected with filariasis, but this parasitic invasion was not, in the opinion of the author, sufficient to account for death, and he thinks that the rôle played by the trypanosome may not have been a purely harmless one. There were certain minor differences between the organism encountered in these animals and that described by Bruce, but Mesnil, who had the opportunity of examining the author's specimens, expressed the opinion that the organisms were identical.

Dodd gives the following measurements:—Average length 93·2 microns, breadth 6·6. The parasite executed somewhat deliberate lashing movements involving distinct but not extensive translation.

Owing to the fact that the animals had been captured only a short time before, it was impossible to make any accurate observations regarding clinical symptoms, and in no case were there any very obvious signs of ill health.

The only abnormality found at the post-mortem examination was a slight general oedematous condition of the tissues.

A few inoculations into rabbits and guinea-pigs failed to cause infection.

(280) Biot (R.) & Richard (G.). **De la Possibilité d'Inoculer le** *Trypanosoma lewisi* **à d'autres Animaux que les Rats.** [The Possibility of inoculating Animals other than Rats with *T. lewisi*.]—*Bull. Soc. Path. Exot.* 1912. Dec. Vol. 5. No. 10. pp. 826-827.

The authors have been able to infect gerboas and dormice with this trypanosome.

In the first gerboa, inoculated intraperitoneally from a rat in whose blood trypanosomes were numerous, trypanosomes appeared on the fifth day, but had disappeared by the thirteenth.

In the second gerboa the period of incubation was twenty days, and the parasites persisted in the blood for seven days.

Rats were also inoculated successfully from the gerboas.

A dormouse inoculated with blood from a gerboa at a time when parasites were present in its blood in a state of division became infected, the parasite appearing in the blood one day later. The trypanosomes multiplied and symptoms of illness made their appearance. The dormouse died on the seventh day, the trypanosomes being scanty at the time of death.

(281) Laveran (A.). **Essais d'Immunisation contre des Trypanosomes Pathogènes.** [Attempts to immunise Animals against some of the Pathogenic Trypanosomes.]—*Bull. Soc. Path. Exot.* 1912. Dec. Vol. 5. No. 10. pp. 877-882.

In this paper Laveran gives the results of some experiments carried out to repeat those of Schilling. Schilling's procedure

(see this *Bulletin*. Vol. 1. No. 2. p. 94) was followed and *T. brucei* and *rhodesiense* were used. Laveran found it very difficult to immunise rats against *T. brucei*, as out of twelve rats, each of which received five injections of dead trypanosomes, not one acquired any immunity. With *T. rhodesiense* the experiments were a little more successful, but only a very transient immunity was acquired which was not comparable to that often obtained by an animal when spontaneous recovery from a trypanosomiasis occurs.

Details are given of some experiments in which an attempt was made to immunise animals with sensitised viruses. *T. brucei* and *T. evansi* were used. Laveran concludes that there is little hope that the method will be of value.

(282) Gonder (R.). **Experimentelle Studien mit Trypanosomen und Spironemen (Spirochaeten).** [Experiments with Trypanosomes and Spirochaetes.]—*Zeitschr. f. Immunitätsforsch u. Exp. Therap.* 1. Teil., Orig. 1912. Nov. 22. Vol. 15. No. 2-3. pp. 257-292. With 1 plate.

This article gives the details of a considerable number of experiments showing the effects of certain staining compounds on ordinary trypanosomes and on arsenic-fast trypanosomes *in vitro*. In the second portion, the details are given of some experiments showing the effects of the serum of animals treated with compounds of arsenic upon certain spirochaetes.

The author's conclusions are as follows:—

1. It can be shewn that while normal trypanosomes can be stained while still alive with certain substances, arsenic-fast organisms are only stained after they are dead.

2. Certain substances cause the blepharoplast of many trypanosomes to disappear. The substances act directly on the blepharoplast, which in the case of the *T. lewisi* tends to approach the nucleus. The auto-oxidation of Laveran and Roudsky does not appear to take place.

3. Trypaflavin, Arsenophenylglycin, and Salvarsan maintain their fixation in the trypanosomes *in vitro*. Mice cannot be infected with trypanosomes treated with these chemical substances.

4. The serum of an animal injected with salvarsan is active against *S. recurrentis* and *S. gallinarum*, *in vitro*, shortly after the injection has been given, and is of therapeutic value.

(283) Thomson (J. G.) & Sinton (J. A.). **The Morphology of *Trypanosoma gambiense* and *Trypanosoma rhodesiense* in Cultures: and a Comparison with the Developmental Forms described in *Glossina palpalis*.**—*Ann. Trop. Med. & Parasit.* 1912. Oct. 18. Vol. 6. No. 3. B. pp. 331-356. With 3 plates.

The majority of the authors' cultures were made with a modified NNN medium, the composition of which was as follows: Agar, 14 g. previously soaked in constant changes of distilled water for thirty-six hours; sodium chloride (pure), 6 g.; distilled water 900 cc. Citrated rats' blood (2 of blood and 1 of 1 per cent. citrate) was added to the melted agar at 45° C to make a mixture of equal parts. The tubes were heated to 45° C for half an hour to destroy the complement and were then sloped. The tubes were

incubated for two days at 25° C to allow of the expression of the water of condensation. There was a considerable degree of uncertainty in all the media tried and a number of tubes had to be inoculated in every case. In inoculating tubes only three or four drops of infected blood should be added to each cubic centimetre of condensation liquid. The optimum temperature for obtaining good cultures which did not die quickly was 22° to 24° C.

The sixth or seventh day was usually most suitable for obtaining subcultures.

It was difficult to obtain good stained preparations from the cultures owing to the salt and free haemoglobin, but it was found that the best preparations were obtained by adopting the following procedure: A drop of the culture liquid is placed on a slide and exposed to the vapour of 4 per cent. osmic acid for thirty seconds, after which it is spread with cigarette paper, again exposed to the osmic acid vapour for a few seconds, and then fixed with methyl alcohol for twenty minutes. The preparations were then stained with Giemsa.

T. gambiense was cultivated for thirty-seven days, during which time it was carried through four generations. *T. rhodesiense* lived only twenty-one days, all flagellates disappearing in the third subcultures.

The forms found in the culture tubes were identical in their chief characteristics with those described by Bruce as occurring in the gut of an infected fly.

The cultures become non-infective as soon as blood-forms disappear; they were non-infective after the third day.

The authors suggest that the failure of cultures to transmit the infection after this period is due to the fact that in cultures the infective form of the parasite, that found in the salivary gland of the fly, does not develop, a special environment being required.

The authors were unable to find any evidence of a sexual cycle.

(284) Roudsky (D.). **Sur un Corpuscule Temporaire de *Trypanosoma lewisi* et de *Trypanosoma duttoni*, simulant, à certaines Phases de son Evolution, un Deuxième Noyau.** [A Temporary Body in *T. lewisi* and *T. duttoni* simulating in some of its Phases a Second Nucleus.]—*Compt. Rend. Soc. Biol.* 1912. Dec. 27. Vol. 73. No. 37. pp. 730-732. With text-figures.

In stained preparations of the blood of the mouse and rat, containing respectively *T. lewisi* and *T. duttoni*, some of the parasites were observed to contain a body which in certain stages of its development resembled a nucleus. The body was found close to and just in front of the centrosome. It was distinguished from the nucleus by its staining more faintly, and by its rounded form.

The structure in question was about three or four times the size of the centrosome, and was at first filled with small basophile granules. As the body increased in size the granules became aggregated and presented an appearance suggesting a large caryosome. Subsequently the body became still larger and the granules became disposed for the most part at its periphery. Later these disappeared, and the body became converted into a large

vacuole staining a faint pink colour. At this stage the structure was larger than the nucleus and caused bulging of some of the parasites.

In one instance the author observed in the situation occupied by this body a homogeneous mass stained blue like the cytoplasm.

The trypanosomes possessing this body practically always had a very long posterior portion.

The structure has not been observed in dividing forms, nor has the author observed it in *T. lewisi* in the rat and *T. duttoni* in the mouse.

(285) Robertson (Muriel). **Notes on the Life-History of** *Trypanosoma gambiense*, **etc.** [Abstract.] — *Proc. Roy. Soc.* 1912. Dec. 17. Series B. Vol. 86. No. B 584. pp. 66-71. With 27 text-figures.

I. Endogenous cycle in the blood.

The short form may be looked upon as the adult blood-type. It is present almost exclusively during the periods when the parasite is scanty in the blood. When multiplication is going on intermediate, long slender, and dividing forms occur. The short forms appear to be responsible for carrying on the infection in the Glossina, and the blood of a monkey is only infective when they are present in sufficient numbers. Intracellular multiplicative forms do not occur in the lungs, liver, or spleen in monkeys.

Round non-flagellate forms are occasionally found in the liver and lungs, apparently between and possibly within cells. They appear at a time when the trypanosomes are being destroyed, but have only been found in a teeming infection examined during the earlier months of the disease. They are apparently about to be destroyed, but their survival in very small numbers as latent forms cannot be excluded.

The differentiation into long and short forms is not an expression of sex.

II. Exogenous cycle in the fly.

While the series of changes undergone in the Glossina up to the time of becoming infective is very definite and constant, the duration of the cycle varies within the limits of more than a fortnight. Trypanosomes never attach themselves while in the gut, nor do they ever disappear from this situation at any period; the development occurs free in the lumen from the start. The parasite enters neither the body cavity nor the body cells.

The earliest processes are characterised by slight and indefinite changes of form. Broad, slender, and degenerating specimens are all present, but only the broader types are found in division at this early stage. These divisions show a suppressed crithidial phase in the young individual. This disappears before the separation of the two products. This peculiarity has never been observed after the 10th day. No other crithidial phase is shown in the gut. The parasites generally start developing in the middle or posterior intestine, and by the 7th to 10th day a large number of trypanosomes are present. The blepharoplast plays the role of a centrosome in the division of the kinetonucleus. The division is not

longitudinal, but practically transverse. Division is often unequal.

Very slender forms are developed about the 8th to 18th day and gradually pass forwards into the proventriculus. This form is the culmination of the development in the gut. The parasites may overflow into the sucking stomach, but are not permanently established there, and they are unable to retain their position if the fly be starved for two or three days.

Up to the 10th to 15th day multiple forms containing a number of nuclei may be seen in certain cases. The evidence is largely in favour of these being degenerative forms, but it is not sufficient to exclude the possibility that some of them may be involution or resting forms. Proventricular forms when injected into clean monkeys do not cause infection.

The long slender forms come forward into the hypopharynx in small numbers at a time. From the hypopharynx they pass backwards along the ducts of the salivary glands. They attach themselves where the narrow duct joins the slightly broader part which leads to the glandular portion proper. They become shorter and broader, and assume a crithidial form. Multiplication occurs and gradually the whole gland is invaded. They develop into trypanosomes almost identical with the blood-forms, but are often a little shorter.

There is the strongest presumptive evidence for considering that these types produce the infection in the vertebrate. It is considered that the development in the glands is the essential part of the cycle, the development in the gut being a somewhat indifferent multiplication to enable the trypanosomes to reach the salivary gland, which alone appear to be able to stimulate the trypanosomes to the apparently essential reversion to the crithidial type.

Sexual differentiation has not been observed; this, however, is not a characteristic feature of flagellate life. Isogamy appears to be usual. The evidence of conjugation is slight, but general theoretical considerations are strongly in favour of the occurrence of some such process.

(286) Kinghorn (A.) & Yorke (W.). **On the Influence of Meteorological Conditions on the Development of** *Trypanosoma rhodesiense* **in** *Glossina morsitans*—*Ann. Trop. Med. & Parasit.* 1912. Oct. 18. Vol. 6. No. 3. B. pp. 405-413.

In a previous report attention has been drawn to facts which indicate that meteorological conditions have considerable influence on the development of the trypanosome in the fly, and more recently valuable evidence has been obtained indicating that such conditions, and particularly temperature, have a very pronounced influence in this respect.

The present paper is a synopsis of the experiments that have been carried out at Nawalia and Ngoa, the former having been already published.

In the Nawalia experiments 330 flies were used, six, and probably ten, of these becoming infective. In five experiments on the plateau 520 clean flies, 'wild' and 'bred,' were used without a single one becoming infective. The most striking difference in

the climatic conditions met with in the two places was the temperature, there being a difference of 15° to 20° F., that at Nawalia being the higher. In order to ascertain the influence of the temperature on the development of the trypanosome in the fly, a further series of experiments was made on the plateau in which an incubator was used, the flies by this means being kept at a temperature approximating to that encountered in the valley at the most favourable season.

No water was placed in the incubator and the warm dry air had a very deleterious effect on the insects, for within a week of the commencement of the incubation 25 out of 61 in the first batch, and 53 out of 72 in the second had died off. Nevertheless two of the first batch and one in the second proved to be infective. It seems obvious therefore that a high temperature favours the development of the trypanosome in the fly, and this would account for the failures in the experiments carried out at the temperature of the laboratory. From an analysis of the positive experiments carried out in the valley it is seen that the majority of successes were obtained in the hot season.

An occasional wild fly was found to be infective on the plateau, although these results were not obtained in the laboratory experiments, and the explanation probably is that the few infected flies found had been infected during the warmer season of the year and had survived to the cold season.

Comparing the results obtained by feeding freshly caught flies on healthy monkeys in the valley with those on the plateau it was found that in the former place one fly in 534 was infective, while in the latter the proportion was 1 in 1,260. The general circumstances would appear to indicate that the only essential difference between the two places was a difference of climatic conditions. As an additional reason for holding this view it is pointed out that in the valley a greater proportion of infective flies was caught in the hot weather than in the cold season.

An additional factor in the development of the trypanosome in the fly possibly is the relative humidity of the atmosphere, but no definite information has been obtained on this point.

In a further experiment it was found that appearances suggest that the first part of the cycle of development can take place at comparatively low temperatures whereas a considerably higher temperature is necessary for the completion of the cycle. It would appear that the first portion can be effected at 60° F. while for the completion a temperature of 75-85° is necessary.

(287) Kinghorn (A.), Yorke (W.), & Lloyd (Ll.). **On the Development of** *Trypanosoma rhodesiense* **in** *Glossina morsitans.*—*Ann. Trop. Med. & Parasit.* 1912. Dec. 30. Vol. 6. No. 4. pp. 495-503.

The authors found that in every fly capable of infecting animals the salivary glands were invaded, and that in flies that were not capable of infecting animals these glands were not invaded by the parasite, although about 20 per cent. of them had trypanosomes in their intestine. A precisely similar state of affairs was

observed in the dissection of 'wild' *G. morsitans*. Of the laboratory bred flies, five out of 132 were capable of transmitting infection, and the salivary glands of 14 out of 620 wild flies were found to be invaded by the trypanosome. All but four of these were definitely proved to be capable of transmitting the trypanosome, the animal upon which the four fed dying before a diagnosis could be made. None of the flies in which the salivary glands were not involved were able to transmit the trypanosome. Similar results were obtained when wild flies were fed on healthy monkeys and the infecting fly isolated.

In order to anticipate the criticism that the parasites were not really in the glands but outside these structures as a result of contamination with the gut, the dissections and examinations were conducted with extreme care. Trypanosomes were found in such numbers as to exclude any possibility of their being outside the glands, and sections of the glands shewed them to be packed full of parasites.

Trypanosomes were present in the intestines of many flies that were examined within a few days of an infected meal, but most of those dissected after the first five or six days were negative. In a certain proportion multiplication of the parasites occurred in the intestine.

The authors have little information as to the reason for this multiplication in the gut of occasional flies only. In the mid-gut of one fly, which died on the twelfth day after having been fed on a guinea-pig infected with *T. rhodesiense*, cysts ranging from 27 to 32 microns in diameter were found. Some of these cysts had thin walls and were filled with a seething mass of flagellates, others had thicker walls and their contents were quiescent. The authors are unable to say whether the fly was infective at the time of death. An animal on which it had fed three days before death did not become infected, and a monkey inoculated with its intestinal content died from an unknown cause two days later.

It was found that inoculation with gut contents failed unless there were also trypanosomes in the salivary glands, and it appeared that if trypanosomes were present in both situations material from these parts was capable of setting up infection on inoculation.

It is uncertain how the salivary glands become infected, but there is a certain amount of evidence to shew that it is secondary, and that it only occurs when the trypanosomes in the gut have reached a certain stage of development, and only then when the conditions of temperature are suitable for the further development of the parasites. Although parasites can develop and multiply in the intestines at fairly low temperatures, trypanosomes were never found in the salivary glands of flies that had not been subjected to temperatures of 75-80° F. Three flies that had been kept at the temperature of the laboratory for forty days after an infecting feed became infective in eight days or less when incubated at 85° F.

The invasion of the salivary gland was observed in flies infected with *T. rhodesiense* only, and never with any of the other trypanosomes dealt with either in the Luangwa Valley or on the Congo-Zambesi watershed.

The authors believe that the presence of trypanosomes in the proboscis of flies is of no special significance, but that it depends upon the passage of infected salivary secretion, or upon regurgitation from the gut during handling.

It is of interest to note that of the 310 'wild' *G. morsitans* dissected as they were brought to the laboratory, recognisable mammalian red corpuscles were found in the intestine of 70, whilst nucleated red corpuscles were found on four occasions only.

Morphology of the trypanosome in *G. morsitans*.—

In a short paragraph it is stated that the form of the parasite occurring in the salivary glands approximates to the short variety in the mammalian blood, but is not identical with it. The predominant type in the intestine is a large broad flagellate, with a feebly developed undulating membrane, and little, if any, free flagellum. The nucleus is fairly central in position, but not infrequently lies a little behind the central point.

A full description of the parasite as it occurs in the fly is left for a further communication.

(288) Halberstaedter (L.). **Versuche mit einem spontan arsenfesten Trypanosomenstamm.** [Experiments with a Strain of Trypanosomes naturally Resistant to Arsenic.]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1912. Oct. Vol. 16. No. 19. pp. 641-647.

The author points out that the great bulk of the literature regarding the occurrence of drug-resistant strains of trypanosomes refers to strains that have been rendered resistant by experiment.

He states however that, apart from such experimentally produced resistance, different species of trypanosomes are variously affected by certain active chemical substances. Trypanrot is effective against mal de caderas, but is practically without effect in nagana. Nearly allied species of spirochates and malarial parasites shew varying degrees of susceptibility to drugs: atoxyl is effective against *S. gallinarum*, but not against *S. duttoni;* salvarsan is more valuable in the case of tertian malaria than in quartan.

Great variation has been observed in the resistance offered by different strains of the same species of trypanosome, but up to the present no record has been made of so high degree of resistance as to be almost absolute against such active arsenical compounds as arsacetin, salvarsan, etc.

The strain in which the author found natural resistance to arsenic was a mal de caderas strain originally obtained from Brazil, which had, since its arrival in Europe, been passed through about 720 passages in mice and rats. Neither the original horse, nor any of the animals through which the strain was passed had been treated with arsenic. The discovery that the strain was resistant to atoxyl was made accidentally.

In the experiments which were subsequently carried out, it was found in the first place that the strain was absolutely resistant to arsacetin. The maximum safe dose for a mouse, viz., 1 cc. of a 4 per cent. solution per 20 g. body weight, had not

the slightest effect on the course of the disease. The strain behaved in a manner exactly similar to a strain that had been rendered resistant experimentally. The resistance of the strain to arsenophenylglycin and salvarsan was then tested.

Maximum safe doses of salvarsan were unable to alter the course of infection in the least in experimental animals. In the absence of another strain of the trypanosome strictly comparative tests could not be made, but controls of a kind were furnished by a strain of nagana. Neither salvarsan nor arsacetin in the dose mentioned was found to have any effect on the caderas strain, while both effected cures in the animals infected with nagana.

Arsenophenylglycin (1 : 1000) delayed the course of the infection slightly, but a single injection of 1 cc. per 20 grammes of a 1 : 600 solution effected a permanent cure. With the nagana strain 1 : 1000 solution did not always cause a complete disappearance of the trypanosomes, and 1 : 1500 produced only a temporary recovery. The nagana strain behaved like an ordinary strain to substances other than arsenic compounds, such as parafuchsin.

The mal de caderas strain was easily affected by potassium antimony tartrate, and to this drug behaved exactly like the normal nagana strain.

Since atoxyl and arsacetin are inactive against trypanosomes in vitro, while salvarsan is active, test-tube experiments were made with the latter. Equal quantities of blood containing trypanosomes and salvarsan solution were mixed together, and the mixture inoculated intraperitoneally into mice after a contact of 20 minutes. The trypanosomes were examined microscopically from time to time.

With the normal nagana strain it was found that salvarsan in 1 : 100000 solution rendered the trypanosomes unable to infect an animal in 20 minutes, and that the power of infecting an animal was only retained by the trypanosomes when the solution used was 1 : 200000. With the caderas strain, on the other hand, a 1 : 2000 solution was required to produce the same effect.

(289) Duke (H. L.). **Some Experiments with Arsenphenylglycin and *Trypanosoma gambiense* in *Glossina palpalis*.—*Proc. Roy. Soc.* 1912. Dec. 17. Series B. Vol. 86. No. B 584. pp. 19-31.**

In the experiments detailed in this paper attempts were made to obtain answers to the following questions :—

1. Does the presence of arsenic in the blood ingested by a positive fly destroy the trypanosomes in that fly?

2. Does preliminary feeding of flies on blood containing arsenic have any effect on the subsequent development of trypanosomes in their interior?

3. If flies are fed on blood containing arsenic shortly after the infecting feeds on a gambiense monkey, are the flagellates still capable of development in that fly? If they can still develop is the resultant strain arsenic-resistant in the blood?

4. Has arsenphenylglycin any prophylactic action against the bite of a fly infected with T. gambiense, and, if so, what is the extent of this protection.

The experiments devised to furnish an answer to the first of these questions yielded results from which the following conclusions were drawn:

Flagellates in the gut of flies fed upon a monkey within 24 to 48 hours of the administration of arsenphenylglycin in doses of 0·1 g. per kilogramme are markedly affected. The flagellates in the salivary glands are not injured in any way, and the fly does not lose the power of infecting.

In the first pair of experiments devised to answer the second question no positive flies were found either among the arsenic or the control batch.

In a second experiment in which a single batch of flies was used for feeding on a monkey having arsenic in its blood before being placed on an infected monkey, it was found that 2·6 per cent. contained flagellates, while in a control batch the percentage was 11·5.

It is pointed out that care must be exercised in drawing any conclusion from the limited evidence furnished by this experiment. From a small number of experiments carried out with the object of answering the third question it appeared that ingestion of arsenic blood immediately after infecting feeds checks subsequent development of flagellates in the fly.

No experiments appear to have been made to furnish an answer to the second part of the question.

With regard to the experiments devised for supplying an answer to the fourth question the following points must be taken into consideration as having important bearing upon the subject:

a. The mere introduction of the proboscis of a positive fly into the skin of its victim can produce infection. A fly need not withdraw blood to infect an animal. This supports the view that the flagellates in the salivary gland are responsible for infection.

b. A single positive fly can infect a monkey on three consecutive days.

c. The facts recorded in Section 1 relating to the persistence of the salivary gland flagellates and the infecting power of the fly even after the gut has been cleared by arsenic feeding. It was found from this series of experiments that arsenphenylglycin in doses of 0·1 g. subcutaneously per kilogramme protected a monkey against infection by positive *G. palpalis* if given within 12 days before exposure.

Half this dose per kilogramme protected a monkey against infection if given within seven days of exposure.

(290) Mason (E.). **Experimental Treatment of Camels for Trypanosomiasis.**—*Dept. of Public Health (Veterinary Section), Cairo.* Paper No. 5. 1912. pp. 3-4.

Reference is first made to an earlier series of experiments in which atoxyl, orpiment, and sodium arsenate were used, and which were recorded in detail in the *Journal of Comparative Pathology and Therapeutics*, June 1911.

The present series of experiments was carried out with "606."

It was found by experiment that the requisite dose was approximately 0·0187 gramme per kilogramme body weight, *i.e.*, about

7 grammes for a camel weighing 375 kilogrammes. The drug was administered intravenously.

A batch of eleven camels was placed under observation, the blood being examined whenever the temperature rose above normal. In the case of nine of these animals the trypanosomiasis was complicated with filariasis. The injections of salvarsan were only given when treatment became urgent, the remaining camels acting as controls until they in their turn required treatment.

In some cases the worm embryos ceased to appear quite independently of the injections. Nine of the animals were under observation for periods varying from four and a half to ten and a half months after treatment without the return of the trypanosomes being recorded. White rats inoculated with blood from these recovered animals failed to react in every case.

In the remaining two camels trypanosomes reappeared in the blood in one and three months respectively. In these cases the dose of "606" was not sufficiently large, only six grammes being administered, while the camels weighed 404 and 384 kilogrammes respectively.

During the treatment temporary blindness was observed in four cases. Attempts to obviate this risk by administering smaller doses failed to produce dispersal of the trypanosomes, though there was no blindness. It seems necessary to give a single dose sufficiently large to disinfect the whole system, or the trypanosomes are not killed. The survivors appear to develop a tolerance to the drug, and a second dose would have to be greatly increased. This would defeat the object of dividing the treatment into two doses, and render the first dose unnecessary.

The camels do not require more than the ordinary amount of rest for recuperation—one or two months.

(291) DE GREEF (M.). **Guérison de Deux Cas de Trypanosomiase du Cheval par l'Orpiment.** [Recovery of Two Cases of Equine Trypanosomiasis under Treatment with Orpiment.]—*Ann. de Méd. Vét.* 1912. Oct. Vol. 61. No. 10. pp. 546-550.

The two cases occurred while the stud at Yakoma was being transferred to Vankerkovenville (Congo) and the parasite responsible was identified as *T. cazalboui*.

The first case was observed in an eight-year-old mare. The symptoms presented were at first very vague but became progressively more marked. There was weakness, emaciation, and later oedema of the limbs, but no very marked rise of temperature. In one eye there was conjunctivitis followed by keratitis and ulceration. The glands of the throat became greatly enlarged, but were not painful on pressure. Trypanosomes were found in small numbers in the blood, but liquid obtained by puncture of the enlarged glands proved negative. Orpiment and tartar emetic were administered, the former as an electuary with extract of opium, and the latter, dissolved in salt solution, was injected into the jugular. The animal received three doses of orpiment of eight and six grammes, and two injections of emetic of one and a half grammes each, within nine days. The trypanosomes disappeared

from the circulation and the animal so improved in condition as to be able to travel three weeks after the commencement of the treatment.

The second animal was only found to be infected with trypanosomes as a result of microscopic examination of the blood, to which all the horses were subjected after the discovery of the first case. The only symptom presented by this case was unilateral keratitis which responded to treatment.

In the first instance this animal received treatment with emetic only as no orpiment was available. Four injections were given, but trypanosomes were still present in the blood nearly three months later. Three doses of orpiment were then given at intervals of one day, the doses being 3·5 to 4 grammes. Trypanosomes were not discoverable in the blood after this treatment.

(292) Holmes (J. D. E.). **Some Experiments in the Treatment of Surra in Camels.**—*Indian Civil Veterinary Dept. Memoirs.* No. 3. [Period covered 1910-1911.] pp. 78-97.

In the experiments detailed in this paper arsenious acid, arsenic tri-sulphide, atoxyl, soamin, tartar emetic, and lithium antimony tartrate were tried alone and in combination.

In the first instance, the effect of a single dose of varying amount was observed, in order to ascertain the amount of the drug which could be tolerated, and the effect of the drug on the trypanosomes in the circulation.

As the periods of intermission in Surra among camels are very irregular, the interval during which trypanosomes are absent from the circulation after a dose of arsenic or other drug gives only a relative indication of the effect of the dose.

The camels used in the experiments had contracted the disease naturally and were in a fairly advanced stage. Some of the animals died from exposure and from dietetic troubles.

It was found that single doses of arsenic up to ten grammes were ineffective in producing a permanent dispersal of the trypanosomes, and that toxic symptoms were produced by quantities of about five grammes and upwards. Similar results were obtained when larger quantities of arsenic were given in a number of doses at intervals of some days.

A dose of one hundred grammes of tartar emetic was found to produce toxic symptoms without proving effectual in dispersing the trypanosomes. Quantities of five hundred grammes and over, administered in smaller doses, and at intervals of a few days over a period of about a month were found to be ineffectual.

The results obtained with arsenic combined with tartar emetic were better in that in some cases trypanosomes were absent from the circulation for some time after the cessation of treatment, but in the two instances in which this happened the camels died.

Treatment with arsenic in conjunction with atoxyl either proved ineffectual or fatal.

Treatment with ten grammes of arsenic and twenty grammes of soamin also proved fatal.

A single dose of ten grammes of lithium antimony tartrate proved ineffectual, as did a single dose of ten grammes of atoxyl.

Arsenic trisulphide proved fatal in a dose of twenty grammes administered in a drench. Soamin in a dose of ten grammes subcutaneously also proved fatal.

Trypanblue injected subcutaneously in a dose of a little less than two grammes was without effect, and the skin at the seat of injection sloughed.

(293) Lanfranchi (A.). **Sur le Diagnostic des Trypanosomiases. Essais d'Identification des Différents Trypanosomes.** [The Diagnosis of the Trypanosomiases. Attempts to Identify Various Trypanosomes.]—*Bull. Soc. Path. Exot.* 1912. Oct. Vol. 5. No. 8. pp. 611-614.

Referring to the publications of numerous authors who have done work in connection with the detection of specific antibodies in the serum of animals affected with trypanosomes, either for purposes of diagnosis, or for the differentiation of different parasites, the author points out that their results are not in concordance. He believes that the divergences of opinion may be accounted for by the different antigens sought, and by differences in the course of the infections, for while in chronic diseases antigen formation is abundant, the opposite is the case in the acute or subacute conditions.

Exact details of the procedure are not given, but the author states that, thanks to a special method, he has been able to immunise dogs against nagana, and experiments have been made with the sera of these animals in conjunction with the sera of rats, guinea-pigs and dogs infected with *T. brucei* and *T. equiperdum*.

The serum of the immunised dogs agglutinated the corresponding trypanosome in dilutions of 1 in 75,000, but he was unable to identify the *T. brucei* by means of the serum because it caused agglutination of *T. equiperdum* in dilutions of 1 in 50,000 to 1 in 60,000.

Precipitin reaction.—The author found that when the serum of a hyperimmunised dog was placed in contact with the serum of animals infected with nagana in the proportion of one to three clear results were obtained.

Negative results were obtained with the hyperimmune serum when used with serum derived from an animal infected with *T. equiperdum*.

If however the blood was obtained when trypanosomes were very numerous a positive reaction could be obtained, especially when the experiments were made with guinea-pig serum.

Positive reactions were obtained at once in almost every case. At first there was a slight haziness which within an hour or so became flocculent, and in tubes incubated at 37° C. for four hours fell to the bottom. Sera heated to 55° C. for fifty minutes gave still more obvious reactions.

Fixation of the complement.—The author has found that if a clear reaction is obtained when the blood used is rich in trypanosomes, the effect is even more distinct when the blood is taken during a trypanolytic crisis.

Positive results were also obtained when the hyperimmune serum of the dog was used with the serum of animals infected with *T. equiperdum.*

Conclusions:—

1. Trypanosomes cannot be identified by the agglutination test with hyperimmune sera.

2. Under certain circumstances the trypanosomes of nagana and dourine can be distinguished by the precipitin test.

3. The complement test can under certain conditions be used for the diagnosis of trypanosomiasis, but differentiation of trypanosomes cannot be effected by its means.

4. The use of a hyperimmune serum has enabled the author to produce evidence of the presence in the blood of affected animals of considerable quantities of antigens.

(294) Knuth (P.) & Bonger (C.). **Nachweis von Trypanosomen bei einem Schlachtochsen mit Milzschwellung.** [The Demonstration of Trypanosomes in an Ox showing Enlargement of the Spleen.]—*Berlin. Tierärzt. Wochenschr.* 1912. Oct. 31. Vol. 28. No. 44. p. 804.

The animal appeared to be in perfect health, but when slaughtered was found to have a greatly enlarged spleen. On a previous occasion examination of specimens from a similar case proved negative, but in this instance trypanosomes closely resembling those first described by Behn in 1910 were found in smears from the liver, spleen, and kidneys. The trypanosomes varied from 50 to 70 microns in length, and from 4 to 6 in breadth. One specimen was found measuring 99 microns. In preparations stained by Giemsa the cytoplasm was found to contain a large number of reddish granules of various sizes. The parasites were very scanty.

(295) Behn. **Weitere Trypanosomenbefunde beim Schafe.** [Trypanosomes in Sheep.]—*Berlin Tierärzt. Wochenschr.* 1912. Dec. 12. Vol. 28. No. 50. p. 934.

In October 1911 the author recorded the occurrence of trypanosomes in a sheep, and in the present short note he records their presence in three animals. Two of the sheep were purchased out of the same flock as that from which the previous animal was obtained, and the third was a six-months-old lamb born of one of these animals. The trypanosomes were exceedingly scanty, and could only be demonstrated in thick films stained by Giemsa. One of the striking characters of the trypanosomes was the large size of the blepharoplast. He was unable to cultivate them in blood-broth.

Seven other sheep obtained from a different source shewed no trypanosomes. The author is unable to say whether any connection exists between the *Crithidia melophagia* and the trypanosome of the sheep.

(296) Rodhain (J.), Pons (C.), Vandenbranden (J.), & Bequaert (J.). **Essais de Transmission du** *Trypanosoma gambiense* **par la** *Glossina morsitans.* [Attempts to transmit *Trypanosoma gambiense* by *Glossina morsitans.*]—*Bull. Soc. Path. Exot.* 1912. Nov. Vol. 5. No. 9. pp. 762-770.

Brief details are given of four series of experiments carried out with Glossina bred in the laboratory.

In the first series the flies were fed upon human patients, in the second upon a goat infected with the human trypanosome, in the third upon a dog and a guinea-pig infected with a strain of trypanosomes from a different source, and in the fourth upon infected monkeys.

From the experiments it is seen that at Sankisia at an altitude of 750 metres the *T. gambiense* can undergo development in *G. morsitans*, and the flies can transmit the infection to animals by biting them.

In two flies which were proved capable of transmitting the trypanosome the salivary glands were found to be invaded with flagellates, but there was no evidence of multiplication in the proboscis. In some cases typical trypanosomes were found in the liquid in the hypopharynx, but the authors think that these had escaped from the salivary glands. They believe that these represent the only infective form.

At Sankisia only 1·7 per cent. of the experimental flies were found to be infected, and the only flies to become infective were those fed upon the infected monkeys. The authors think that this may be explained in part by the fact that the trypanosomes were always numerous in their blood.

The period elapsing between the infective feed and time at which the flies became infective was in one case less than 24 days, and in the other two 30 and 35 respectively.

Although the experiments shew that *G. morsitans* is capable of transmitting *T. gambiense* the authors have been unable to obtain any direct evidence that these flies play any part in the transmission of the trypanosomiasis which is responsible for large numbers of deaths in Katanga. They have found villages where only *morsitans* occurs, but they are not certain whether the inhabitants have not visited areas where *palpalis* is present, such areas being not far distant. The authors have not been able to make experiments with wild flies because a large proportion of the flies are infected with *brucei* and *congolense*, and a larger number of animals than were at their disposal would be necessary.

(297) Blanchard (M.). **Marche de l'Infection à** *Schizotrypanum cruzi* **chez le Cobaye et la Souris.** [The Course of Infection with *Schizotrypanum cruzi* in the Guinea-pig and the Mouse.] —*Bull. Soc. Path. Exot.* 1912. Oct. Vol. 5. No. 8. pp. 598-599.

Two infected guinea-pigs were originally received by the author. The blood of these animals was found to contain only a very few parasites at the time of receipt, but there was a gradual increase in the number present until the 30th day, after which the number

diminished until by the 44th day none could be found. One of the guinea-pigs was subjected to four subsequent intraperitoneal inoculations with blood containing a large number of parasites, but failed to become reinfected. Two young born of this animal were found to be as susceptible to infection as control animals.

Trypanosomes were not discoverable in the blood of the second guinea-pig after the 44th day. It was killed on the 67th day and its blood used for the inoculation of two fresh animals. One of these became infected, and the other resisted infection, although it was subsequently proved to be susceptible by a positive inoculation. The guinea-pigs shewed no clinical evidence of infection.

Three other guinea-pigs inoculated in series from the second of the two original animals became infected, and the course of the infection was practically the same in two of the cases. The period of incubation was 9 to 13 days, and the parasites increased in number in the blood up to the 34th and 43rd days. The third guinea-pig shewed parasites in its blood on the 8th day after inoculation and they became numerous by the 16th day. During the next eight days there was a rapid decrease in the number present, but they did not completely disappear until the 85th day. Subsequently they reappeared and increased in number until the time of death on the 127th day.

Seven passages have been made in mice, and the course of the infection has been very constant, and it has always terminated fatally. The period of incubation in this animal is 6 to 7 days. The parasites rapidly increase in number in the blood and remain numerous until death about the 15th to 20th day.

(298) Brumpt (E.). **Pénétration du *Schizotrypanum cruzi* à travers la Muqueuse Oculaire Saine.** [Penetration of *Schizotrypanum cruzi* through Healthy Conjunctiva.]—*Bull. Soc. Path. Exot.* 1912. Nov. Vol. 5. No. 9. pp. 723-724.

The most susceptible monkey to infection with *Schizotrypanum cruzi* is *Cercopithecus ruber*. The author placed some faecal matter from an infected *Conorhinus megistus* upon the eye of one of these monkeys and a fatal infection ensued.

The faeces of Conorhinus and Cimex are very virulent and contain very mobile slender trypanosomes which have a great power of penetrating into tissues.

Experiments in which the faecal matter was placed upon the skin of rats and monkeys had negative results.

SPIROCHAETOSIS.

(299) Gasperi (F. de). **Présence d'un Spirochète dans le Sang d'un Cobaye.** [The Presence of a Spirochaete in the Blood of a Guinea-pig.]—*Bull. Soc. Path. Exot.* 1912. Oct. Vol. 5. No. 8. pp. 589-591. With 1 text-figure.

The spirochaete here described was encountered in cultures made from the heart blood of a guinea-pig which, in the course of other experiments, had been inoculated with garden earth which had been ground in mortar with water at 85° C.

The cultures were made in glucose agar and incubated at 42° C., and the spirochaete was found in the water of condensation on the day following the preparation of the cultures.

The organisms varied from 16 to 24 microns in length, and measured 0·3–0·4 in width. They showed five to eight turns, and the ends were distinctly tapering. The spirochaetes died after about forty-eight hours, and the author was thus prevented from isolating it.

With the ŏbject of ascertaining whether this spirochaete was in the nature of an accidental invader the inoculation experiments were repeated with similar materials ten times, but in no case was a spirochaete found.

The author concludes that the spirochaete is a specific organism of the guinea-pig.

(300) Marchoux (E.) & Couvy (L.). **Argas et Spirochètes.**—*Bull. Soc. Path. Exot.* 1912. Dec. Vol. 5. No. 10. pp. 796-798.

Referring briefly to the investigation of various authors regarding the presence of " granules " in the bodies of ticks infected with spirochaetes, Marchoux and Couvy state that they have examined *A. vespertilionis*, *R. ricinus* and *L. echidninus* and have found the " granules " in each species and in each individual, although the ticks had not been fed upon animals affected with spirochaetes. They conclude that the " granules " have no connection with spirochaetes. They propose to show in a future communication that in Argas the spirochaetes behave like bacteria and do not undergo any cycle of development comparable to those seen in intermediary hosts among the protozoa.

(301) Messerschmidt (T.). **Die chemotherapeutische Beeinflussung der Hühnerspirochätenkrankheit, durch die im Handel befindlichen Jodpräparate.** [The Effects of Commercial Compounds of Iodine in Spirochaetosis of the Fowl.]—*Zeitschr. f. Immunitätsforsch. u. Exp. Therap.* 1. Teil., Orig. 1912. Nov. 2. Vol. 15. No. 2-3. pp. 293-302.

In these experiments a number of different preparations of iodine were used. None of them was found to have any toxic effect nor was any of the slightest use either for preventive or curative treatment.

(302) Patton (W. S.). *Spirochaeta ctenocephali*, **sp. nov., parasitic in the Alimentary Tract of the Indian Dog Flea**, *Ctenocephalus felis.*—*Ann. Trop. Med. & Parasit.* 1912. Oct. 18. Vol. 6. No. 3. B. pp. 357-359.

In view of the recent work of Basile and others regarding the development of the parasite of canine kala azar in the dog flea—*Ctenocephalus canis*—importance attaches to the study of the parasites natural to the dog flea, and particularly in India where canine kala azar has not as yet been observed. The common dog flea in Madras is *C. felis*, *C. canis* having been found so far on the jackal only.

The parasite described in this paper has been found both in the larva and in the adult flea. Out of a total of some 1500 larvae the parasite was found in two only derived from fleas fed upon cats kept at the laboratory, and it was found in one adult flea obtained from a dog out of 500 fleas examined. The author proposes the name *Spirochaeta ctenocephali.*

(303) Fontana (A.). **Metodo per Colorare Intensamente e Rapidamente il *Treponema pallidum* ed Altri Spirocheti.** [A Quick Method of Staining Spirochaetes intensely.]—*Pathologica.* 1912. Oct. 1. Vol. 4. No. 94. pp. 582-583. With 2 text-figures.

The material for examination is diluted with a drop of distilled water, spread on a slide, allowed to dry in the air, and then fixed by heat. Cover the preparation with 5 per cent. tannic acid in distilled water and warm until vapour arises (20 secs.). Wash in tap water for 30 seconds. Pour on the slide a few drops of ammoniacal solution of silver nitrate (prepared by adding ammonia to a five per cent. solution of silver nitrate in distilled water until the precipitate which is first formed is just redissolved) and warm for 20 to 30 seconds. Wash and dry. The spirochaetes are stained from an intense yellow to a deep brown.

LEISHMANIASIS.

(304) Nicolle (C.) & Blaizot (L.). **Virulence des Cultures de *Leishmania infantum.* Sensibilité du Chacal au Virus du Kala Azar Tunisien.** [Virulence of Cultures of *L. infantum.* Susceptibility of the Jackal to the Tunisian Virus.]—*Bull. Soc. Path. Exot.* 1912. Nov. Vol. 5. No. 9. pp. 721-723.

Having lost their human strain of Leishmania which had been preserved by passage since 1907, the authors attempted to renew it by inoculating animals with cultures derived from the same strain. Their first attempt, in which twenty-five cultures of the forty-fifth generation were used for the intraperitoneal inoculation of a dog, failed to infect.

A fresh series of experiments was then instituted, a more recently isolated Tunisian strain being employed. A number of rabbits and guinea-pigs were inoculated without result.

A puppy, about a fortnight old, was inoculated intravenously with fifteen cultures of the same generation sixteen days old. The inoculation was followed by immediate prostration with marked dyspnoea; the animal recovered, however, after some hours. When the dog was killed on the 72nd day parasites were found to be fairly numerous in the spleen and very numerous in the bone-marrow. A second dog inoculated from the first was found to be infected when it was killed on the 82nd day. A jackal, also inoculated with material from the first dog, when killed on the 84th day was found to be infected and parasites were found to be fairly numerous in the marrow, scanty in the spleen, and absent from the liver. The inoculations were intraperitoneal, but the exact material used is not stated.

(305) Laveran (A.). **Infections des Souris et des Rats dues au Kala-azar Méditérranéen et au Kala-azar Indien.** [The Infection of Mice and Rat with Mediterranean and Indian Kala-azar.]—*Bull. Soc. Path. Exot.* 1912. Nov. Vol. 5. No. 9. pp. 715-721.

After a brief reference to previous successes obtained by himself and Yakimoff, the author gives details of experiments made with twenty-six mice.

The strain used was that occurring in Tunis, and the materials were obtained from dogs and mice.

The mice were inoculated intraperitoneally, and spleen-pulp, liver, and bone-marrow were used. In four cases there was severe generalised infection, in four instances the infection was generalised but moderate, and in thirteen it was generalised but slight. In the remaining five mice the infection was only localised, or there had been complete recovery before the animals were killed.

Severe infections were found in mice killed twenty-four and thirty-one days after inoculation. In a third mouse this condition was found when it was killed on the 138th day, but the author considers this to be exceptional. In most of the mice killed at about this time the infection was only a slight one, and the animals appeared to be on the way to recovery. One mouse died after having been inoculated three times, twice with culture, and once with the spleen pulp of a heavily infected mouse. The enlarged spleen was found to contain large numbers of the parasite, and there were no lesions to account for the animal's death, but the author does not feel justified in attributing it to kala azar, as he has found more severe infections in mice which survived.

Eight days after inoculation the parasites were found to be more or less numerously present in the peritoneal exudate. Many were found within mononuclear leucocytes and endothelial cells, but free forms also occurred. In some instances the infection remained confined to the peritoneum, but in other cases the liver, spleen, and bone-marrow were invaded.

Contrary to what might have been expected, it was not easier to produce infection with cultures containing flagellates. It was found that the flagellates were rapidly ingested by phagocytes, while the non-motile forms of the organism were able to live and multiply within the leucocytes and the endothelial cells.

Only negative results were obtained when mice were inoculated intraperitoneally with cultures of *L. infantum*. In one instance a slight infection was produced by intravenous inoculation with this material.

A series of passage experiments showed that there was no exaltation of virulence of *L. infantum* for the mouse, but rather the reverse. In infected mice there is a variable amount of enlargement of the spleen, up to six times the normal, and the parasite is most frequently found in that organ. In one instance in which smears from the spleen were negative, the inoculation had been intra-hepatic instead of intraperitoneal as was generally the case.

In rats the course of the infection is much the same as in mice. In one rat which died twelve days after inoculation (method not specifically stated) the parasite was present in fairly large numbers in the peritoneal exudate, but was very scantily present in the enlarged spleen.

In view of the fact that the different behaviour of the Mediterranean and Indian strains in dogs has been put forward as evidence contra-indicating their identity, the author advised Row to carry out experiments with the Indian strain.

Row states that he has succeeded in producing generalised infection in two mice by inoculating them intraperitoneally with material obtained from subcutaneous nodules produced in a *Macacus sinicus* with the human strain of Indian kala azar.

Mention is made of Patton's success in infecting a rat with material from a person dead of Indian kala azar, and reference is made to Patton's view that the two are not identical.

It is admitted that there is not sufficient evidence upon which to base any definite view, but it is pointed out that although the Indian strain appears to be the rather more virulent for the mouse, both are capable of producing generalised infection.

(306) Sergent (Edm.), Sergent (Et.), Lhéritier (A.), & Lemaire (G.). **Transmission de Leishmania de Chien à Chien par Piqûres de *Pulex serraticeps*.** [The Transmission of Leishmania from Dog to Dog through the Bites of *Pulex serraticeps*.]—*Bull. Soc. Path. Exot.* 1912. Oct. Vol. 5. No. 8. pp. 595-597.

I. A young bitch in good condition was subjected to the bites of fleas (*P. serraticeps*) on eighty-two occasions, the average period of biting being five minutes. Each flea used had previously been fed upon an infected dog. Before the experiment was commenced the dog was under observation for two months and appeared healthy. Liver punctures were negative. During the course of the experiment the dog was very carefully protected against and kept free from all ectoparasites.

Rather more than a month later the animal began to lose condition and the clinical symptoms of infection made their appearance, but examination of marrow from the femur was negative.

About two months later the animal began to improve in condition, and was then killed.

At the post-mortem, preparations from the liver were negative, but in smears from the spleen and bone-marrow Leishmania was found in small numbers, and apparently in a degenerated condition.

Cultures from the spleen on NNN medium yielded numerous Leptomonas after eight days, five out of twelve tubes being successful. The strain had, up to the time of writing passed through thirteen subcultures.

Cultures from the bone marrow were negative.

A control dog kept under identical conditions, save for the biting of the fleas, shewed no infection.

II. A young dog was bitten daily for fifteen days by a single flea which had been fed upon an infected dog every two days during the preceding fortnight. The animal was killed at the end of three months, but no evidence of infection could be detected.

III. A young dog was bitten daily for four days by a single flea which had had a single meal on an infected dog two days previously. The result in this case was also negative.

Microscopic examination of the intestinal contents of fleas were made and the following forms were found:—

In the intestinal contents of two fleas that had fed on an infected dog and in two out of nine fleas fed upon a supposedly healthy dog were found large numbers of resting forms about five microns in diameter. In many cases these were collected together into clumps. They possessed a fairly large nucleus and a blepharoplast.

In the faecal matter from the same fleas, and in the contents of the posterior portion of the intestine, slender, binucleated flagellates, measuring ten to twelve microns in length, were found. Transitional forms were also observed.

One cell was observed containing three parasites in the resting stage.

(307) Wenyon (C. M.). **Experiments on the Behaviour of Leishmania and Allied Flagellates in Bugs and Fleas, with some Remarks on Previous Work.**—*Jl. London School Trop. Med.* 1912. Dec. Vol. 2. Part 1. pp. 13-26.

This paper contains a criticism of the view held by Patton that the bed bug is the true host of Leishmania, and much evidence is adduced to indicate that this is not the case. The author gives evidence which he has obtained indicating that it is not improbable that *Stegomyia fasciata* is the true host of the parasite.

Experiments carried out by the author on himself with *Cimex lectularius* indicated that no multiplication of the parasite took place in the only three bugs that were found to contain a small number of flagellates, out of a total of a hundred and five that were fed.

In a further series of experiments attempts were made to infect human and dog fleas, but in no instance was any development of the parasite discovered.

During the course of these experiments it was found that fleas infected with *T. lewisi* remain infected for long periods whether they feed upon human or rat blood, and that the trypanosome appears to undergo its development in *Pulex irritans* as well as in the dog flea, *Ctenocephalus canis*.

Nöller's observation that it is the ingestion by the rat of infected faeces from the flea that is responsible for the transmission of the trypanosome was confirmed. This was done by feeding a dog flea on an infected rat, subsequently feeding it upon a second

rat, and giving the faeces passed during the first feed to a third rat. Only the third rat became infected.

The author thinks that BASILE and others may have been mistaken in their view that they had traced multiplication forms of Leishmania in the flea, owing to the fact that the flea contains a natural herpetomonas almost indistinguishable from cultures of Leishmania, and no steps were taken in his experiments to exclude this possibility. The author believes, with NICOLLE and BASILE, that the Mediterranean disease in dogs and children is the same.

(308) LAVERAN (A.). **Présentation de Macaques inoculés avec succès au moyen d'une Culture de la Leishmania du Bouton de Delhi.** [Monkeys successfully inoculated with Cultures of the Leishmania of Delhi Boil.]—*Bull. Soc. Path. Exot.* 1912. Oct. Vol. 5. No. 8. pp. 573-575. With 1 plate.

The original material was derived from some cultures received from Row at Cambay. No motile flagellates were discoverable in the cultures on their arrival in Paris, but subcultures were obtained on the Novy-Nicolle medium. The strain was kept alive in the laboratory by sub-inoculating about every fortnight, the tubes being incubated at 22° C.

The author has obtained the best results by inoculating intradermally. He has not been able to produce infection by inoculation into mucous membranes.

The period of incubation is variable, but the minimum observed was fourteen days. The lesions take the form of little intradermic indurations at the seats of inoculation which vary in size up to that of a pea. There is no inflammatory congestion, nor pain on pressure. When the lesions attain the size of peas they come to a head, and if they are incised they are found to contain a droplet of thick whitish liquid.

Nodules which are not incised become covered with small brown crusts which are easily detached leaving the ulcerating tissues beneath exposed. In some cases the nodules are reabsorbed.

Parasites are scantily present in preparations made from the crusts, or from the sero-sanguinolent liquid beneath them, but they may be numerous in preparations made with material scraped from the depth of the ulcers. The great majority of the parasites appear to be free, but this may be due to the destruction of the host cells during the preparation of the films. The parasites present the characters of *L. tropica.* The nuclei are rounded and not flattened against the side of the parasites as is often the case in *L. americana.*

In one animal the ulcers had not healed after 74 days.

The author states that his results do not differ greatly from those obtained with the Tunisian virus by NICOLLE and MANCEAUX. He thinks that there is no specific difference between the parasites of Delhi Boil and Gafsa Boil (Tunis).

The author has been unable to infect dogs and mice with cultures of the Indian strain of *L. tropica.*

(309) Row (R.). **Some Experimental Facts *re* Kala-Azar (Indian).** —*Jl. of Trop. Med. & Hyg.* 1912. Nov. 1. Vol. 15. No. 21. pp. 327-328. With 2 text-figures.

In the present paper some account is given of the results obtained by infecting *Macacus sinicus* with original virus and an old culture derived from the original virus.

The virus was obtained from a human source by splenic puncture and was fairly rich in parasites. A monkey was inoculated by scarification with some of this original material, and nine weeks later small pin-head nodules developed at the two seats of inoculation. In preparations made from material squeezed from these lesions the parasites were recognisable, and after a period of six weeks were still to be found, but at this time they were not quite so typical as those found in the first instance.

A second monkey was inoculated subcutaneously with a fifth subculture from the same case. The culture was full of rounded forms a fortnight after it had been observed to be rich in flagellates. The doses injected were 0·3 and 0·15 cc. Nothing was observed until five months after inoculation when small hard nodules were found under the skin at the seats of inoculation. Preparations were made from material obtained by puncture and a fair number of parasites like those found in the spleen were found. In culture these parasites were found to be present in the preflagellate stage at 24 hours, and flagellates were observed on the fourth day.

VARIOUS BLOOD PARASITES.

(310) Carini (A.) & Rudolph (M.). **Sur quelques Hématozoaires de Lézards au Brésil.** [Some Haematozoa of Lizards in Brazil.] —*Bull. Soc. Path. Exot.* 1912. Oct. Vol. 5. No. 8. pp. 592-595. With 10 text-figures.

1. *Haemogregarina ameivae.*—This parasite has been encountered in a number of specimens of *Ameiva surinamensis*. It occurs in the peripheral blood, in the interior of the red cells.

In the living state it appears as an elongated clear space with an irregular outline. No movement is exhibited.

In preparations stained with Giemsa the protoplasm is found to be very delicate, scarcely stained at all, and always rather shrivelled. The parasite is elongated in shape and somewhat irregular in outline. The ends are rounded, and one may be larger than the other. The nucleus is oval in shape and is situated towards the smaller end of the parasite. It occupies practically the whole width of the body and stains of a violet tint.

The organism measures 11 to 13 microns in length by 3 to 4 in width. It possesses a capsule which is not distinctly visible in the endoglobular forms, but is quite distinct in the extra-globular forms encountered in smear preparations made from the internal organs.

As a rule the parasite lies in the centre of the red cell causing displacement of the nucleus, which is often associated with some enlargement and deformation.

In spite of careful examinations of preparations from a number of lizards no multiplication forms have been seen. In a single instance a number of clear regularly oval spaces were seen in the liver which had the appearance of being empty cysts.

2. *Plasmodium minasense.*—This organism is an endoglobular pigmented parasite, and the authors have encountered it in small numbers in stained preparations on one occasion only.

The parasite which is rounded or oval in shape is situated at one of the poles of the red corpuscle invaded by it, the cell showing little or no alteration in shape. Parasites of various sizes were seen, the largest measuring 4-5 microns.

The protoplasm stains blue, and contains a number of small vacuoles. Granules of pigment are scattered through the cytoplasm. The granules are irregular in shape and size, and of a brownish-black colour. In some cases they are scattered through the protoplasm in a disorderly fashion, and in others they are collected together into a single mass.

The nucleus is composed of granules of chromatin which stain of a pale pink colour.

Certain details of structure suggested that the parasites seen were male and female gametes, but the number found was so small that no definite opinion as to this could be formed.

A small number of dividing forms have been seen. In these cases the number of merozoites was very small.

3. *Trypanosoma species?*—This organism has also been studied in stained preparations only. The parasite is stumpy, but somewhat variable in shape. In every specimen the protoplasm was traversed by clear streaks which were not constant in position. The cytoplasm stained a fairly intense blue colour and appeared to be finely granular. The nucleus was oval in shape and measured 5 by 3 microns. It occupied a position about the middle of the body and stained uniformly pink.

The blepharoplast was situated close to the nucleus, was oval in shape, and was surrounded by an unstained zone. In more intensely stained specimens a delicate filament could be seen starting at the blepharoplast, passing along a very poorly developed undulating membrane, and terminating in a short free flagellum.

The parasite appears to be related to the *T. perroteti*, and the name *T. rudolphi* is suggested for it.

(311) Leger (A.). **Présence de deux Leucocytozoaires morphologiquement distincts dans le Sang du Chien, à Bamako (Haut-Sénégal et Niger).** [The Presence of two Morphologically Distinct Leucocytozoa in the Blood of the Dog at Bamako (Upper Senegal).]—*Compt. Rend. Soc. Biol.* 1912. Oct. 25. Vol. 73. No. 29. p. 376.

The author mentions the occurrence in the dog of the leucocytozoon previously recorded as occurring in the spotted hyena (*Hyena crocuta*) (see Ref. 100, this *Bulletin*. Vol. I. No. 1. p. 58) The *Leucocytozoon canis* has also been found, but double infection has never been observed in the same animal. The new

leucocytozoon is described as being smaller, and more stumpy than *L. canis*. Two dogs were found to be infected out of 114 examined. The parasite invades mononuclear leucocytes only, and no free forms have been observed. The name *Haemogregarina chattoni* is suggested.

(312) Yakimoff (W. L.) & Kohl-Yakimoff (Nina). *Toxoplasma canis* (**Mello**).—*Archiv f. Protistenkunde.* 1912. Vol. 27. pp. 195-206. With 2 plates.

The first section of this paper is devoted to an account of the discovery by various authors of Toxoplasma in a number of animals. Nicolle and Manceaux discovered the parasite in a rodent (*Ctenodactylus gondi*) in Tunis, Splendore in the rabbit in Brazil, Mello in the dog in Italy, Prowazek in a mole from Japan, and Carini in the pigeon in Brazil.

According to Nicolle and Manceaux, Toxoplasma is curved in outline, with pointed ends, but occasionally round forms may be found. As a general rule the parasite discovered by these authors measured about five microns in length by three in width, but larger forms up to seven microns in length were observed. The parasite showed no motility. The cytoplasm was alveolar in structure. The nucleus was rounded or oval and measured about two to three microns. Multiplication is said to take place by longitudinal division. Both free and intracellular forms were seen, the latter occurring most frequently in lymphocytes. The majority of the parasites were found in the spleen, liver, and mesenteric glands; they were present in smaller numbers in the lungs and kidneys, and exceptionally in the heart blood and bone marrow.

These authors succeeded in transmitting the parasite to one out of twelve guinea-pigs inoculated, but they were unable to obtain cultures on either Novy's or Nicolle's blood-agar. They were unable to infect apes or rats.

According to Splendore, affected rabbits show no symptoms save wasting and, in some cases, some paralysis of the hind legs just before death. At the post-mortem the liver and spleen were found to be enlarged and besprinkled with greyish-white points. In many cases there was ulceration of the intestinal mucous membrane, and a large quantity of serous fluid in the body cavities.

Splendore's organism was rather longer and narrower than that described by Nicolle and Manceaux, and in addition to the curved forms this author found cyst phases containing either free parasites or parasites in a condition of irregular division. He also encountered round or amoeboid forms. There was a variable amount of compact cytoplasm which stained of an intense blue colour with Giemsa.

Splendore believes that multiplication takes place both by longitudinal division and by schizogony. He succeeded in transmitting the parasite to other rabbits, guinea-pigs and birds; he failed however to infect dogs, and was unable to cultivate the parasite.

According to SPLENDORE, CARINI succeeded in infecting rabbits, guinea-pigs, white rats, and pigeons with Toxoplasma, the latter giving the best results. He failed to transmit the infection to the dog.

CARINI agrees with SPLENDORE regarding the methods of multiplication.

Toxoplasma in the dog was first discovered in Italy by MELLO. The parasite was found in all the organs, but principally in the liver and lungs. Toxoplasma was exceedingly numerous in the ulcerated intestine.

In smear preparations from the liver the parasite resembled *T. gondi* described by NICOLLE and MANCEAUX, save that it was very much smaller, measuring only 2 microns. Free and intracellular forms were seen, and in many instances as many as 60 individuals were found in a single cell.

CARINI was able to infect pigeons from dogs infected with Toxoplasma. In one case the infection was successfully transmitted to another dog, but a second dog failed to become infected, as did also rats, sheep, horses and cows.

CARINI is of the opinion that the Toxoplasma occurring in the dog in Brazil is not identical with that found by MELLO, on account of the great discrepancy in size. He considers it to be identical with that found in the rabbit.

The present authors encountered *T. canis* in a dog that was under experiment with a strain of *Leishmania infantum* derived from Tunis. The greater number of parasites were found in the bone-marrow and spleen, infection being less extensive in the liver, and still less in the lungs. Parasites were found once only in the blood.

The parasite occurs typically in a crescentic form, one end being pointed, and the other more or less rounded. The cytoplasm stains of a blue colour to a varying depth with Giemsa, and is alveolar in structure. Many of the organisms contain vacuoles. The nucleus stains red or reddish-violet, is oval or more rarely rosette shaped, and contains either a darkly staining caryosome or several chromatin granules. In many specimens the cytoplasm at one end stains reddish, and in a few of the parasites red granules are present at one or other end. The appearances closely resemble those shown by some haemogregarines and sarcosporidia.

In addition to the crescentic forms there are oval forms, the cytoplasm of which is honey-combed in appearance. The nucleus is irregular in outline and often fragmented, and is sometimes set at right angles to the length of the parasite.

In dividing forms, of which a large number were seen, the nucleus appears, at least in dry-fixed specimens, to divide amitotically, division of the cytoplasm taking place longitudinally. Many intermediate forms between the crescentic and oval forms were seen.

In the schizonts and encysted forms a large number of nuclei were observed. The number varied from two to sixty, and the fragments developed into crescentic and oval forms. During the process of schizogony residual bodies which stained deep blue were formed.

The intracellular parasites were enclosed in mononuclear lymphocytes, or neutrophile polynuclears, and never more than two schizonts were seen in a single cell. In two instances the parasite was found enclosed in liver cells.

The authors are of the opinion that the *T. canis* is a parasite specific for the dog.

With regard to the classification of the parasite, the authors agree with Prowazek that it should be classed with the Haemogregarina among the Leucocytogregarina.

Infection experiments failed as the infected dog had been dead two days when the experimental inoculations were made, and the parasites were then dead.

The authors do not think that the infection was brought from Tunis in the dog infected with *L. infantum* for the following reasons:—Toxoplasma was not found in smears from any of the organs of the imported dog. Of the eight dogs inoculated from the African dog this one only showed the Toxoplasma infection, and they cannot suppose that this dog was alone susceptible. The dog infected with Toxoplasma was from two to three months old and was born in Germany. They therefore think that it was a case of spontaneous infection.

(313) Carini (A.). **Sur un Nouvel Hématozoaire du Pigeon.** [A New Haematozoon of the Pigeon.]—*Compt. Rend. Soc. Biol.* 1912. Oct. 25. Vol. 73. No. 29. pp. 396-398. With 5 text-figures.

The parasite described in this paper was only encountered once, and owing to an accident a bird inoculated with it died without having become infected.

At first sight the author thought that the organism was Haemoproteus, and in consequence of that the examination of living preparations was not very thorough.

The parasite is practically always found in the interior of red corpuscles, of which it causes neither enlargement nor decolourisation. When the organism is large the nucleus is pushed to one side. Some of the corpuscles which contained no parasites were observed to have a speckled appearance. Active movement of the parasite within the corpuscles was not observed.

In preparations stained by Giemsa or Leishman the protoplasm stained of a blue or violet colour, and often contained vacuoles and brown granules. The pigment was disposed towards the periphery or the poles of the elongated organisms.

The nucleus was represented by a small homogeneous mass with indistinct contour, and stained pink.

Not uncommonly two or more parasites were found in the same corpuscle.

The following forms were observed:—

Small forms measuring only 2-3 microns. These forms were rounded, and their protoplasm stained more intensely at the periphery than at the centre. Traces of pigment could be observed in these.

Rounded or oval intermediate forms resembling the small ones except in size.

Dumb bell forms closely resembling the gametes of Halteridium. The largest of these measured from 9 to 11 microns in length, by 4 to 5 in width.

Forms provided with pseudopodia. Pseudopodia were observed in rounded, oval, and dumb bell forms. The pseudopodia varied from mere projections to long slender processes exceeding the parasite in length.

Careful examination of preparations from the spleen, liver, lungs, kidneys, and bone marrow failed to reveal any multiplying forms.

The name *Plasmodium columbae* is suggested for the parasite.

(314) Leger (M.). **Présence de *Haemogregarina canis* en Corse.** [The Occurrence of *Haemogregarina canis* in Corsica.]—*Compt. Rend. Soc. Biol.* 1912. Dec. 13. Vol. 73. No. 35. pp. 617-618.

After a brief reference to the discovery of this parasite by different authors in various tropical countries, and to Basile's discovery of it in a dog in Rome, the author describes its occurrence in one dog out of twenty examined in Corsica. The animal was also the host of *F. immitis*, but the infestation was a slight one.

In preparations of blood stained by Giemsa the leucocytozoon was found to be invariably intracellular, and enclosed in a capsule which to some extent resisted the penetration of the stain.

The cyst was oval and measured from 10 to 12·5 microns in length, by 4 to 6 in width. The ends were similar. The nucleus was relatively large, and took the form of a slightly curved rod staining of a bright pink colour.

The author has encountered forms resembling those described by Wenyon, the parasite being folded upon itself in the form of a U with unequal arms. The protoplasm of the parasite was granular.

The host-cells were mononuclear leucocytes. In some cases the nucleus was fragmented, the fragments tending to stain less intensely.

HELMINTHS.

(315) Mason (E.). **Larvae of *Linguatula taenioides* in Camels.**—*Dept. of Public Health (Veterinary Section), Cairo. Paper No.* 5. 1912. p. 10.

"A very high percentage of camels are found to harbour in their mesenteric lymphatic glands the larvae of *Linguatula taenioides*. The glands are found to be hyperaemic and enlarged, or are oedematous, and contain cavities. The parasites are particularly numerous in the cavities, and in these cases are also found free in the peritoneum. The discovery of this parasite (which has been signalled in India) in camels probably explains to some extent the frequency with which peritonitis occurs in this species. The parasites do not themselves produce the peritonitis, but by destroying the mesenteric glands favour the entrance of bacteria."

(316) Maupas (E.) & Seurat (L. G.). **Sur un Nématode de l'Intestin Grêle du Dromadaire.** [A Nematode of the Small Intestine of the Dromedary.]—*Compt. Rend. Soc. Biol.* 1912. Dec. 20. Vol. 73. No. 36. pp. 628-632. With 10 text-figures.

Nematodirus mauritanicus, n. sp. The worm is small and slender. It is provided with a thick cuticle which at the anterior end is doubled, forming a slight vesicular swelling, which is transversely striated. In the post-vulvar region the cuticle is formed of two layers, the inner of which is thick and homogeneous, and the outer very thin and striated transversely. There is no evidence of longitudinal striation.

Anterior to the vulva the cuticle is quite soft and devoid of all striation for a distance of 2 to 3 mm. Anterior to this longitudinal striation appears and is continued forwards to the point where the cuticle is double, transverse striation appearing at this point.

The mouth opens in a short funnel-like depression and leads to a straight oesophagus which shews considerable swelling in its posterior part.

The nerve-ring is situated just behind the middle of the oesophagus. The excretory pore opens behind the junction of the oesophagus with the intestine. The cervical papillae are very small.

The female measures from 21 to 24 mm. in length. Posteriorly the female is truncated, but carries a short delicate prolongation. The anus is situated 105 microns from the truncated end, and the vulva a little posterior to the middle point of the body.

The short straight vagina leads to two saccules of unequal size.

The eggs contained in the uterus are arranged in two parallel rows in the posterior portion of the body. The eggs are large, and measure 220-280 microns, and eggs containing larvae are found side by side with eggs in the morula stage.

The male varies from 13 to 15 mm. in length.

The caudal bursa is composed of two large lateral wings and a small posterior wing which is divided into two portions by a wide gap, each part being supported by a ray which is bifid at its extremity.

The two spicules are brown in colour and very slender. They measure about one-third of the length of the parasite and are fused together by means of a thin membrane for six-sevenths of their length.

(317) Bauche (J.) & Bernard (P. N.). **Note sur quelques Filarioses Animales de l'Annam Central.** [Animal Filariases in Central Annam.]—*Bull. Soc. Path. Exot.* 1912. Oct. Vol. 5. No. 8. pp. 622-624.

Subcutaneous filariasis of the dog.—The occurrence of this parasite in two cases, identified by Railliet and Henry, has already been recorded by the authors, but they have now encountered thirty infected dogs. The parasite—*Dirofilaria repens*—was found in thirty out of a hundred dogs taken at random. In each

animal from 8 to 30 specimens were found, the females outnumbering the males in the proportion of two to one.

The authors state that examination of the immature parasites, of the adults, and of their natural habitat enables them to assert that the parasite is not the *Dirofilaria immitis*. There can be no doubt that subcutaneous filariasis of the dog is a pathological entity, special symptoms characterise the affection, and a diagnosis can be based upon the characters presented by the embryos in the circulating blood. All attempts at treatment have failed.

Microfilaria of the pig.—This parasite was encountered in the blood of a young pig during the authors' observations on the peritoneal and pulmonary filariae of the pig. Although hundreds of animals have been examined they have not encountered it a second time.

In the fresh state the parasite measures about 100 microns in length by 4 in breadth. It is very active, but the movement does not involve much translation. The parasite does not possess a sheath. The cephalic extremity is bluntly rounded. The body tapers slightly in its posterior fifth towards the caudal extremity which is also rounded.

In preparations stained with haematin and eosin the average length is about 60 microns, and the body shews three constant specialised parts: 1, a cephalic portion in the form of a V with the apex directed backwards; 2, a ring around the worm practically at right angles to the long axis of the body at a distance of 26 microns from the anterior end; 3, an oval area situated 37 microns from the anterior extremity. The authors have not observed the adult form of the parasite.

Setaria labiato-papillosa (Alessandrini, 1838). This parasite is practically constantly present in the peritoneal cavity of cattle and buffaloes slaughtered for food at Hué, each animal harbouring from 2 to 20 specimens. The young form of the parasite is often found in the anterior chamber of the eye of the horse.

Setaria equina (Abildg. 1789). This parasite is practically always present in the peritoneal cavity of horses.

Ocular filaria of the fowl. *Oxyspirura mansoni* is very commonly found in the conjunctival cul-de-sac of the fowl, but it does not appear to cause any symptoms.

(318) Railliet (A.), Henry (A.), & Joyeux (C.). **Sur deux Trématodes de Primates.** [Two Trematodes of the Primates.] —*Bull. Soc. Path. Exot.* 1912. Dec. Vol. 5. No. 10. pp. 833-837. With 1 text-figure.

After giving a list of the trematodes, 6 species, already discovered in the Primates, with a brief account of the characters of each, the authors pass to the description of (1) a new species and (2) a parasite which has been described as occurring in man only.

Eurytrema brumpti n. sp. About three hundred specimens of this parasite were collected from the hepatic and pancreatic ducts of an adult female chimpanzee from the Congo.

The body of the parasite is leaf-shaped, greyish-white in colour, and speckled with black and brown. It measures from 3·5 to

4 mm. in length by 1·8 to 2·3 in breadth. The oral sucker is subterminal and opens on the under surface. The ventral sucker is placed at the junction of the anterior and middle thirds. The cuticle is covered with minute scales. The intestinal branches are simple, narrow, and slightly undulating. They extend through about three-fifths of the length of the body. The excretory apparatus has not been thoroughly examined, but the terminal vessel opens in the middle line at the posterior extremity. The genital pore opens at a point anterior to the bifurcation of the intestine. The testicles are at the level of the ventral sucker and, although widely separated from each other, they lie between the branches of the intestine. The ovary is small, rounded, and placed almost in the middle plane of the body, but is slightly displaced towards one side. The vitelline glands are placed laterally, external to the branches of the intestine, and posterior to the ovary.

The posterior third of the body is occupied by the convolutions of the uterus. The eggs contained within the uterus are provided with a thick brownish shell with an operculum at one pole.

Watsonius watsoni (Conyngham, 1904). Six specimens of this parasite were found in the intestinal canal of an old female *Cercopithecus callitrichus* from French Guinea.

The body in preserved specimens is greyish-white in colour, oval in shape and thick. The anterior extremity is rather more attenuated than the posterior. The ventral surface is flat, while the dorsal surface is markedly convex. A fixed specimen measured 5·8 mm. in length by 4·2 mm. in width. On the ventral surface about a quarter the length of the parasite from the anterior end there is a prominent papilla, at the summit of which the genital pore opens. The posterior end of the parasite is occupied by the ventral sucker which measures about 2·5 mm. in diameter.

The digestive canal starts at an infundibulum which is not, properly speaking, a sucker. The pharynx has two obvious lateral diverticula. Bifurcation of the intestine takes place opposite the genital pore, and the thick branches reach almost to the posterior sucker.

The testicles, which are small, are placed one in front of the other, about the middle in the body. They are very clearly lobulated and almost ramified. The female generative organs are placed in the middle line about midway between the posterior testicle and the posterior sucker. Eggs were not observed in the uterus, and no doubt the specimens were immature.

(319) Mitter (S. N.). **A Resumé of our Knowledge on the Occurrence of *Gnathostomum spinigerum* in India and its Relation to a Similar Parasite found in Man.**—*Veterinary Jl.* 1912. Dec. Vol. 68. No. 450. pp. 687-690.

The parasite, which was identified by Neumann, was found in a tumour in the stomach of a cat. The worm has been recorded as occurring in *Felis catus*, *F. concolor*, and *F. tigris*. According to Cobbold it has also been found in a tumour in the stomach of a pariah dog. The present author has found it in a leopard.

The male parasite measures about 5 mm. in length, by 0·5 mm. in breadth, the female being about twice that size.

The parasite in the fresh state is reddish in colour. Four portions are recognisable: a well-marked bulbous head or cephalic portion, a constricted neck, a body, and a tail. The body after leaving the neck becomes dilated and forms a ventral bend and is constant in diameter. The tail is rather narrower and blunt-pointed.

The cuticle of the bulb is covered with eight rows of chitinous leaves, which have their posterior edges notched into spines. The anterior portion of the body is thickly covered with similar trident cuticular laminae. In the middle region the leaves are simple and conical. The cuticle in the posterior portion has no appendages. The oral aperture is simple and guarded by two fleshy lips. The oesophagus is highly developed and expanded at its lower extremity.

The tail of the male is spiral and there are eight genital papillae, while that of the female is straight and trilobed.

From a perusal of the literature referring to them the author believes that *G. spinigerum* and *G. siamense* are practically identical.

MISCELLANEOUS.

(320) Bouet (G.) & Roubaud (E.). **Myiase Prévaginale chez la Vache à *Chrysomyia (Pycnosoma) megacephala* Fabr., en Afrique Occidentale. Spécificité Parasitaire des Larves Cuticoles de cette Mouche.** [Myiasis in the Cow in West Africa caused by *Chrysomyia megacephala*.]—*Bull. Soc. Path. Exot.* 1912. Nov. Vol. 5. No. 9. pp. 737-739.

After passing references to observations by Rovere and Brodes of this condition in the Belgian Congo recorded in 1910, the authors state that one of them observed a case at Seguela, Ivory Coast, in 1907. In this case there was a tumour as large as a fist in the right lip of the vulva which contained a large number of larvae. The larvae when fully developed were identified as being those of *Chrysomyia megacephala*, as were those observed in Rovere's cases. There was a discharge of sanious pus from the orifice, and when the lips were everted there was found an opening as large as a franc-piece leading to a cavity which contained a hundred larvae. The tumour was said to have developed in a fortnight.

Removal of the larvae with the curette and careful washing-out of the cavity with cresyl for a few days lead to healing.

The majority of the larvae were in a comparatively advanced stage of development. When placed in tubes containing dry or moist earth or sand they rapidly developed into pupae. Those in the tubes containing dry earth remained on the surface during the process, but those in the tubes containing moist earth buried themselves to a depth of two or three centimetres.

From these observations it would appear that this fly is a parasite that is specific for cattle. Joyeux records the occurrence of

the larvae in tumours on cattle in French Guinea. The invasion by the parasite does not appear to be of an accidental nature, and ROVERE's observations on the biology of the parasite appear to support this view.

According to this author the female fly deposits eggs to the number of a hundred on the hair of cattle, attaching them by means of a special mucus-like material. When the eggs hatch out the larvae penetrate directly into the skin and the subcutaneous tissues, producing necrosis and ulceration. The eggs are never laid on pre-existing wounds. The fact that in the present instance the larvae were all in the same stage of development indicates that the eggs were all laid at the same time by a single insect, whereas if the eggs had been laid on a pre-existing wound this would have been less easy to explain.

From the records of the occurrence of this fly it would appear that it is widely distributed in Africa, but like ROVERE, the authors have been unable to capture the fly in the wild state.

(321) HARTLEY (P.). **On the Immune Bodies Occurring in Rinderpest Immune-Serum.**—*Indian Civil Veterinary Dept. Memoirs. No.* 3. [Period covered 1910-1911.] pp. 216-230.

The author passes in rapid review the work that has been done in connection with the precipitation of various antitoxins by means of chemical substances, and states that his experiments were begun with the object of discovering with which fraction of the proteins in the immune serum the immune bodies are associated.

A number of experiments were carried out with four samples of serum. The serum was dialysed against tap water and distilled water for three days each, the precipitate obtained being shaken up with sufficient salt solution to make up the original bulk of the serum used. The precipitate did not completely dissolve, but formed an emulsion. This emulsion was found to have the same protective effects as the serum in the same doses. The filtrate had no such effect.

Further experiments shewed that if the precipitate were collected and dried *in vacuo* over sulphuric acid, the powder obtained effectively protected against the simultaneous injection of 0·5 cc. of virulent blood. The powder was smiply emulsified in salt solution.

The author's conclusions are as follows:—

1. When rinderpest immune serum is dialysed, the immune bodies are precipitated. The filtrate from the dialysed serum fails to protect susceptible animals against the disease.

2. By this process the rinderpest prophylactic can be prepared in the dry condition.

3. The tests of the dry powder which have been carried out show that the loss of immune bodies is inappreciable and that the dried powder, when dissolved or emulsified, and injected into animals, protects against a simultaneous inoculation of virulent rinderpest blood.

4. By this method about half of the total proteids, which take no part in the immunising process, are eliminated.

5. The rinderpest immune bodies differ from diphtheria and tetanus anti-toxins. The former appear to be similar to the insoluble globulins (Euglobulins); the latter are similar to the soluble globulins (pseudo-globulins).

(322) Cross (H. E.). **The Preparation of Anti-Rinderpest Serum by the Injection of Virulent Artificial Peritoneal Fluid.**—*Indian Civil Veterinary Dept. Memoirs. No.* 3. [Period covered 1910-1911.] pp. 206-215.

The preparation followed the plan devised by Ruediger which was based upon the discovery of Adil Bey and Nicolle that the peritoneal fluid is very virulent.

A solution of 0·5 per cent. of potassium citrate was injected into the peritoneum at the height of a reaction resulting from inoculation with virulent blood. It was found that the injection of this solution in the ratio of 1000 cc. per 100 lbs. body-weight caused death in thirty-six hours to eleven days, and it was determined by experiment that the maximum safe dose that could be administered was 800 cc. per 100 lbs. In the preparation of the serum the quantity was fixed at 700 cc.

By strictly comparative experiments it was found that the serum obtained when this artificial peritoneal fluid was used for hyperimmunising was of lower potency than that obtained when virulent blood was used. This was the reverse of what Ruediger found. The artificial peritoneal fluid is not simply a dilution of the normal fluid as was shown by experiment.

Conclusions.

1. By using artificial peritoneal fluid the amount of virulent material for hyperimmunising purposes is considerably increased, and a marked saving in the cost of serum preparation is effected.
2. The serum from animals injected with artificial peritoneal fluid is usually weaker than the serum prepared by the injection of blood.
3. Artificial peritoneal fluid injections are well absorbed and do not produce sloughing.

(323) Holmes (J. D. E.). **Further Testings of the Haemorrhagic Septicaemia Anti-serum and Vaccine.**—*Indian Civil Veterinary Dept. Memoirs. No.* 3. [Period covered 1910-1911.] pp. 242-247.

This short paper forms a continuation of a paper published in an earlier number of the same Journal (No. 1). A brief general account is given of the results obtained in the field, and the details of a small number of experiments are added.

The following are the conclusions arrived at regarding the serum:—

1. The serum confers an immediate protection against the inoculated virus.
2. The immunity following an injection of serum was tested and found satisfactory up to four weeks.
3. The injection of a suitable dose of serum protects in not less than 90 per cent. of cases. A small percentage of animals cannot be protected even by large doses of serum.
4. A potent serum gives immunity in doses which vary according to the size and species of the animal—

For cattle the dose varies from				5 cc. to 20 cc.
For buffaloes	,,	,,	,,	20 cc. and upwards.
For ponies	,,	,,	,,	5 cc. to 20 cc.
For mules	,,	,,	,,	5 cc. to 20 cc.

As the serum is innocuous, and as the period of immunity is somewhat lengthened by increased doses, it is recommended that except in cases of young animals and cattle under 300 lbs., the full dose of 20 cc. should be used.

Conclusions regarding the vaccine:—

1. The vaccine is innocuous. In some cases the injection caused a slight swelling at the seat of inoculation which disappeared in a few days.
2. It confers protection against the inoculated virus for a period of four to six weeks.
3. The protection is not immediate. It sets in about four days following the injection of the vaccine.
4. The vaccine protects in about 75 per cent of cases.
5. The dose of vaccine varies from 5 cc. to 10 cc. according to the size of the animal. A like dose appears to be required for cattle, buffaloes, ponies and mules.

(324) Bevan (Ll. E. W.) & Millington (T. G.). **Quarter-Evil in Southern Rhodesia.**—*Jl. Comp. Path. & Therapeut.* 1912. Dec. Vol. 25. No. 4. pp. 286-291.

The authors' experiments are divided into three series, and the objects with which they were carried out and the conclusions arrived at in each series are as follows:—

Series 1.—To determine whether the black-quarter vaccine issued by the Bacteriological Laboratory, Pretoria, affords immunity against the form of quarter-evil occurring in Matabeleland.

Conclusions:

(1) That the Transvaal black-quarter vaccine, in suitable doses, can be safely applied to sheep.

(2) That this vaccine has the power to modify the reaction due to inoculation with the local virus.

Series 2.—To test whether an animal immunised with Rhodesian vaccine would resist inoculation with a fatal dose of virulent muscle obtained from the Transvaal.

Conclusions:

(1) A vaccine can be produced from the muscle of an animal dead of the Rhodesian form of quarter-evil.

(2) Such a vaccine, in suitable doses, can be applied with safety to sheep.

(3) Such a vaccine will confer immunity against a fatal dose of infective muscle of an animal dead of Transvaal black-quarter.

Series 3.—To determine whether the so-called "struck" or "strike" of Romney Marsh sheep is identical with the quarter-evil of South Africa.

Conclusion:

From cross-immunity experiments it would appear that a close relationship exists between the quarter-evil of various parts of South Africa and the so-called "struck" of Romney Marsh sheep.

It should be noted that these conclusions are based upon the results obtained in a very limited number of experiments.

(325) Blacklock (B.). **The Resistance of *Ornithodorus moubata* to Various Sheep-Dips.**—*Ann. Trop. Med. & Parasit.* 1912. Dec. 30. Vol. 6. No. 4. pp. 429-433.

In these experiments a number of dips were used and in each case the solution was prepared in the first instance in the manner laid down in the instructions.

A. Animal experiments.

1. Prophylactic.—The skin of animals (generally goats) having been shaved was soaked with the solution to be tested. Ticks were placed upon the animals while the skin was wet and also after it had dried.

Many experiments were made with Cooper's, Savar's, Hayward's Yellow Paste, and MacDougall's dip, to ascertain whether they

prevented ticks from feeding on the animals. In many cases the ticks refused to feed, but as the same was observed with control animals probably the reason lay with the ticks and not with the dip used.

2. Curative.—The ticks were allowed to feed upon the shaved skin of an animal, and, while still feeding, the various dips were applied to them at different intervals after the commencement of the meal, the dips being poured into the feeding glasses and completely covering the parasites. Scarcity of material prevented these experiments from being carried out as completely as was desirable, but it was gathered that the sooner the dip was applied after the commencement of a feed, the more likelihood was there of the ticks becoming loosened, and apparently also of their subsequently dying.

B. In vitro.

In these experiments the ticks were placed in test-tubes and the dips poured on to them, the ticks being prevented from rising to the surface of the liquid by means of a piece of blotting paper. Examples are given showing that a bug was placed in a 1 in 50 solution of Little's dip for four, eight, sixteen, and thirty-two minutes, the parasite being taken out, dried and warmed between each immersion. At the end of the series of immersions it was alive and active. After a period of rest for ten hours it was again immersed for sixty-four minutes; it was still alive and active, but it was found to be dead after an immersion lasting a hundred and twenty minutes.

Using Cooper's dip in the same strength (1 in 50) a tick was found to survive immersion for two hundred and sixty minutes.

The author states that it is well to draw attention to the fact that ticks belonging to Argasidae are generally supposed to have greater powers of resistance than other ticks.

The prophylactic and curative properties of Cooper's dip were tried with solutions of the strength recommended and of greater strengths.

The ordinary strength of solution applied to shaved skin did not completely prevent the ticks from feeding, either while the skin was moist, or after drying. When applied to ticks actually feeding it frequently failed to make them release their hold, and in one case a solution of twice the ordinary strength was applied to ticks feeding on a dog fifteen minutes after the commencement of the feed and kept in operation for two and a half minutes. The ticks went on feeding and were alive and active twenty-four hours after removal. In vitro two hours immersion failed to kill ticks, and in one experiment five hours was effective.

Similar results were obtained in Little's dip. In one experiment a 1 in 50 solution was applied to two ticks feeding on a goat, the application being maintained for twenty minutes. At the end of the time both the ticks were fast, and were alive and active after twenty-four hours.

In vitro twice the strength of solution recommended failed to kill ticks after five hours' immersion.

With MacDougall's dip the results were rather variable. Some parasites fed on the treated skin. But in some cases parasites

feeding, especially when they had only just commenced, were dislodged, and some of these died within twenty-four hours.

In vitro ticks survived thirty-two and sixty-four minutes. In one experiment a tick died after two hours' immersion, but others survived five hours.

Savar's dip.—This dip was not effectual as a prophylactic. In curative experiments ticks were killed in thirty minutes.

In vitro ticks survived two hours' immersion, but not five.

Hayward's Paste.—The prophylactic action of this material was not reliable, and, in the case of feeding ticks the application was not effective in every case, parasites surviving a 1 in 100 solution for thirty minutes.

(326) Jastrembsky (D.). **Zur Frage über die Negrischen Körperchen.** [Regarding Negri Bodies.]—*Centralbl. f. Bakt.* 1. Abt., Orig. 1912. Nov. 9. Vol. 67. No. 1-2. pp. 65-68. With 1 plate.

The author's observations were undertaken with the idea of confirming or otherwise the statements of a number of observers who claim to have discovered Negri bodies in the nervous system of normal animals and of animals suffering from diseases other than rabies. He examined Ammon's horn from the brains of 19 perfectly healthy cats, and in six instances found in the protoplasm of the nerve cells bodies somewhat resembling small Negri bodies. In some cases they were scanty and in other numerous. The largest measured 1·4 microns. He does not think that they have anything to do with Negri bodies, principally because these bodies showed a strong affinity for the methyl blue in Mann's stain.

(327) Carini (A.) & Maciel (J.). **La Pseudo-rage ou Paralysie Bulbaire Infectieuse au Brésil.** [False Rabies or Contagious Bulbar Paralysis in Brazil.]—*Bull. Soc. Path. Exot.* 1912. Oct. Vol. 5. No. 8. pp. 576-578.

As pointed out by the authors, the disease here described appears to correspond exactly with that described by Aujeszky in Hungary in 1902, and if the two are identical this is the first record of its occurrence outside that country. The disease affects cattle. The symptoms are very characteristic, and the disease is very rapidly fatal, death occurring as a rule in 24-48 hours. The most striking symptom is intense itching of various parts of the body. The irritation is so severe that the animals do themselves serious bodily harm in their efforts to rub and bite the affected parts. In Brazil the disease is known as " Peste de Coçar " indicating the most marked symptom.

The authors have proved the virulence of the nervous system and the blood by intracranial and subcutaneous inoculation respectively, and they have infected rabbits and cattle with material derived from previous experimental cases. In every case the characteristic symptoms were presented. Rabbits died in three days, and cattle in eleven days.

At the post-mortem examinations no lesions of any magnitude were discovered, the only alterations being a few haemorrhagic

points in the nervous system and slight congestion of the mucous membrane of the alimentary tract.

The causal agent has not been discovered, and all attempts to cultivate it have failed.

The disease does not appear to be very rare as reports of its occurrence have been received from a number of different places. In some instances outbreaks are limited to a few animals, but in others the losses have been considerable.

(328) Fantham (H. B.). **Note on the Occurrence and Distribution of *Herpetomonas pediculi*.—*Ann. Trop. Med. & Parasit.* 1912. Oct. Vol. 6. No. 3. B. pp. 403-404.**

The author's reason for drawing attention to this parasite is the attention that is being paid to the problems of the transmission of leishmaniasis, spirochaetosis, and trypanosomiasis.

The organism is a natural parasite of the body and head louse, and has no connection with either Leishmania or Trypanosoma.

The parasite has been observed in England and in India and Tunis.

Reports.

(329) Gold Coast. **Report of the Veterinary Department for 1911.** [Beal (W. P. B.).]—1912. Accra: Printed at the Government Press.

This Report comprises an account of the clinical work and farriery, cattle trade and statistics, slaughterhouse statistics, tours of inspection, brief descriptions of the contagious and infectious diseases met with, which include anthrax, contagious bovine pleuro-pneumonia, epizootic lymphangitis, filariasis, fowl cholera, piroplasmosis, septicaemia haemorrhagica and trypanosomiasis. In the treatment of the latter disease some success appears to have been obtained with arsenic in various forms combined with different salts of antimony. Eight cures are said to have been obtained out of twenty horses treated. In connection with preventive measures Beal has recommended that horses should be given 20 grains of orsudan on alternate days when passing through fly country. In particular fly belts it is recommended that the horses be smeared over with a preparation of pounded tobacco rubbed down with "Moshi" butter, this salve being lightly applied over the whole body.

Experiments were also made to see whether the administration of arsenical preparations would act as a prophylactic in fly districts. Thirteen horses were taken out on manoeuvres during the months of February, March and April. Three of these died of trypanosomiasis and Beal is informed that this is the lowest rate of mortality that has occurred since horses were taken out on manoeuvres. Another horse was "well drugged with arsenic and smeared" and sent to a noted fly district. The animal worked there for ten days and then returned to Accra. No trypanosomes were discoverable in its blood on its return. The following flies have been identified:—*G. palpalis*, *G. tachinoides*, *G. fusca*, *G. nigro-fusca*, *G. longipalpis* and *G. morsitans*. The report includes a list of fourteen helminths met with, and also a list of five grasses said to be of good feeding value.

(330) British East Africa. **Report of the Department of Agriculture, Nairobi. 1911-1912. [MS.]**

Report of the Veterinary Department.

East Coast Fever.—In the report regarding this disease the following points are dealt with:—The history of the disease in the Protectorate; Immunity; The division of the country into "clean" and "infected" areas, with the limits of each; Measures for dealing with the disease, and the regulations which should be in force to control the movements of cattle within the Protectorate.

Contrary to what is found to be the case in South Africa, it is said that calves are relatively less susceptible than adult animals, and that this fact can be used with advantage, in that young animals can be exposed to infection, and, acquiring immunity, reduce the losses for which the disease is responsible. Acting on the lines suggested by this fact it is held that the disease could be to a great extent controlled by allowing the calves to acquire immunity early in life.

Facts show that the country can be divided into two areas, one clean and one infected. The clean area occupies the central portion of the Protectorate, and is somewhat triangular in shape, the base being directed towards the north. This clean area almost divides the infected area into two. On the west the infected area extends right into Uganda, and on the east to the coast.

The plan of causing calves to become infected is not applicable to the clean area, and the measures for the protection of this area against contamination are directed towards preventing the entry of infected cattle into it.

The following summary of the regulations for the control of movement of cattle within the Protectorate is given:—

(1) Within clean areas movement should only be made under permit.
(2) From clean area to clean area through an infected area movement should be by rail only and under permit.
(3) From a clean area to an infected area: Movement under permit, and the branding of cattle entering highly endemic areas.
(4) Movement within infected areas by permit, save that cattle from a slightly infected area should not be moved to a highly endemic area unless they are branded.
(5) Movement from highly endemic areas to clean areas under permit.
(6) Immune cattle to be moved with permit throughout the Protectorate.
(7) Cattle used for transport to have passed the immunising test, to have a distinguishing mark, and to be accompanied by certificate.

Rinderpest.—Practically the whole of the Nyanza Province is infected, and the mortality is great. Efforts to suppress the disease by the application of protective serum were to a great extent rendered useless owing to the movement of cattle by the natives. Isolated outbreaks have occurred in other parts and these have been promptly arrested by serum treatment.

Pleuro-pneumonia exists in one district only, and the herds have been confined to an isolated area.

No cases of *anthrax* have been verified.

Anaplasmosis is fairly prevalent, but no serious losses have been reported.

Cases of *trypanosomiasis* in cattle have been observed somewhat frequently on some of the rivers and on Victoria Nyanza, and

among native cattle on the coast, but no cases have been reported from elsewhere.

Coccidiosis of bovines has been occasionally reported, but no serious loss has been recorded.

Horse sickness has been reported in a few isolated cases, but indications are not wanting that during the coming season the disease may be very prevalent.

Epizootic lymphangitis has increased to a large extent, cases having been recorded in practically every settled district. The fact that an infected horse is still capable of work for some time renders control of this disease difficult.

A disease resembling ulcerative lymphangitis is reported from the Uasin Gishu Plateau. This condition is a chronic one extending to several months. The disease is characterised by the appearance of discrete hard crusts under the skin, which may make their appearance all over the body. In time these tend to extend and coalesce, the detachment of the raised crust with the hair involved leaving slowly healing ulcers. There is no appreciable exudate.

The principal diseases of the sheep are briefly dealt with, scab being considered at the greatest length.

Pleuro-pneumonia is prevalent among goats in certain districts, but segregation has prevented the spread.

Sarcoptic scabies has been responsible for the death of a number of goats. The native sheep are also susceptible to this disease, but not to so great an extent as the goat. The wool breeds appear to be immune.

Swine fever in the Protectorate is a very much more severe disease than that known in Europe, practically every pig that becomes infected dying.

Tick fever in dogs has been very prevalent, but the use of trypanblue has been extremely valuable as a curative agent.

Distemper has caused considerable losses at some places.

Report of the Veterinary Pathologist.

In connection with East Coast Fever experiments have been made on the following lines:

1. To prove by the agency of what ticks the transference is effected.
2. To ascertain what immunity is possessed by young calves.
3. To ascertain the value of inoculation by intraperitoneal, intrasplenic, and intrajugular of spleen or other organ pulp.
4. To prove that East Coast Fever in the Protectorate is identical with that occurring in South Africa.
5. Medicinal treatment.

In connection with the first of these it has been proved that *R. appendiculatus* having fed as a larva upon a infected animal will transmit the disease as a nymph, and probably a nymph feeding upon an infected animal will transmit as an adult, but proof of this has not been furnished. So far experiments with *R. evertsi* have failed. It appears to be possible that the "yellow backed" tick (*R. pulchellus*) may prove to be capable of transmitting the infection.

Experiments are at present being carried out to ascertain whether calves have a higher degree of resistance than adult animals, and some of the results obtained appear to suggest that such is actually the case.

Experimental inoculations have had variable results, and appear to suggest that material from every animal is not of the same value for inoculation purposes, and that therefore the results depend to a great extent upon the material used. It remains to be ascertained what are the means of recognising good from bad material. Experiments have conclusively proved that the disease occurring in the Protectorate is identical with that observed in South Africa.

No attempts at treatment have influenced the course of the disease. In this connection one experiment with "606" has been made. A spirochaete, probably *S. theileri*, has been encountered both in specimens of blood sent into the laboratory, and in the blood of some of the laboratory animals. In the latter no symptoms were observed, though the parasite is credited with causing anaemia and death by the owners of infected cattle.

Among the affections due to worms mention is made of the occurrence of *Bilharzia crassa* in the portal vein of oxen coming from Uganda, and also of filarial embryos in the peripheral blood.

Among the conditions referable to the presence of trypanosomes in the blood of equines mention is made of one particular parasite which originated from a camel coming from Boran. This parasite is under study in Uganda, and it is interesting to note that it has not been found possible to transmit it by means of the common tsetse fly *G. palpalis*.

Another trypanosome, probably a new species, was encountered in some mules taken to Voi, where they remained a few days only. The symptoms presented by some of the affected animals were comparable to those of horse sickness. The trypanosome was of very low virulence for all the other animals experimented upon.

In connection with the occurrence of horse sickness it is stated that while a few cases of this disease have been observed there is no doubt that many animals show swelling of the head and other symptoms closely simulating those of horse sickness but not caused by this virus. Such cases have been observed in animals affected with trypanosomiasis and nuttaliasis.

A few cases of nuttaliasis have been observed, and the only tick which has so far been proved to be a transmitting agent is *R. evertsi*.

In certain localised parts there appears to be a disease of donkeys characterised by anaemia, wasting, and dropsy in which no piroplasm or trypanosome can be discovered.

Blue tongue in sheep is recorded on various farms, and it is believed that in some cases mild attacks occur which escape notice, but result in great loss of condition, loss of wool, and abortion. A vaccine can be prepared against this disease. Swine fever encountered in British East Africa is far more fatal than that occurring in Europe. Scarcely a pig survives. At post-mortem examination there are found marked inflammation of the stomach, great enlargement of the spleen, petechiae in the kidneys, often

large haemorrhagic areas on the heart, and oedema of the lungs. In the large bowel there may be ulceration. Investigations would appear to indicate that the disease is distinct from that occurring in Europe, one point suggesting this being that the Africa virus is far less resistent to heat, 60° C. destroying it in ten minutes, whereas the European virus resists this temperature for 24 hours. Further investigations suggest that the disease is contracted by the ingestion of infective material, and that the infective material does not retain its virulence for long outside the body.

Book Review.

(331) Hoare (E. W.). **A System of Veterinary Medicine.** By various Writers. Edited by E. Wallis Hoare. 1st Edition. Vol. 1. 1327 pages. 1913. London: Ballière, Tindall & Cox. [42*s.* net.]

This volume is devoted to the microbial diseases, and the portion of it relating to diseases occurring in tropical countries, or of special interest to veterinarians in tropical countries extends to some three hundred pages. Piroplasmosis, trypanosomiasis, leishmaniasis, spirochaetosis, heartwater, blue tongue, horse sickness, epizootic lymphangitis, rabies, Mediterranean fever, and rinderpest are dealt with. As the book is not primarily devoted to the consideration of tropical diseases it is obvious that the accounts of the tropical diseases cannot be exhaustive. The fact that the descriptions have been written for the most part by authors in tropical countries who come into direct contact with the diseases described is of great value. The additions to our knowledge regarding tropical diseases follow each other so rapidly that it is impossible for a book of this nature to be quite up to date at the time of publication, but nevertheless as a general text-book the volume is valuable.

It is to be regretted that the term *Piroplasma parvum* is used in the section dealing with East Coast Fever, although it is pointed out in the introductory paragraphs that *Theileria parva* is the name now generally accepted for the designation of this parasite, and in the same portion of the book there occur a few errors in the spelling of names. The life cycle of *T. parva* is passed over with a bare mention that work has been done on it and that Koch's bodies are specific. The non-inoculability of the disease by means of blood does not appear to have received mention save in the introduction to the subject, where it is briefly referred to. In the section dealing with the coccidiosis of the rabbit it is said that in the process of formation of the sporoblasts the protoplasm of the oocyst divides into two spheres, each of which again divides into two; whereas it is known that the four sporoblasts are formed simultaneously.

It is a matter for regret that the form in which the references are given is not consistent throughout the book. In some portions the references are given in their entirety, while in others the source of information is indicated only by the name of the journal and the year.

The volume includes a complete index.

The general plan followed in the various chapters is good, and the information is well arranged.

RECENT LITERATURE.

[Continued from BULLETIN No. 2, pp. 132-138.]

Babesiasis.

(332) BOUET (G.) & ROUBAUD (E.). La Piroplasmose (Nuttalliose) de l'Ane en Afrique Occidentale. [Piroplasmosis (Nuttalliasis) of the Donkey in West Africa.]—*Bull. Soc. Path. Exot.*, 1912. Dec. Vol. 5. No. 10, pp. 806–808.

(333) GILRUTH (J. A.). The Introduction and Spread of the Cattle Tick (*Boophilus annulatus*, var. *Microplus*), and of the Associated Disease Tick Fever (Babesiasis) in Australia.—*Proc. Roy. Soc. Victoria*, 1912. Aug. Vol. 25. (New Series.) Pt. 1, pp. 15–22.

Filariasis.

(334) LOW (G. C.). The Life of Filarial Embryos outside the Body.—*Jl. Trop. Med. & Hyg.*, 1912. Nov. 15. Vol. 15. No. 23, pp. 338–339.

(335) MITTER (S. N.). *Filaria immitis* in Calcutta.—*Bull. Soc. Path. Exot.*, 1912. Nov. Vol. 5. No. 9, pp. 731–733.

(336) SAISAWA. Untersuchungen über Hundefilarien. [Researches on the Dog Filaria.]—*Centralbl. f. Bakt.*, 1. Abt., Orig., 1912. Nov. 9. Vol. 67. Nos. 1/2, pp. 68–75. With 2 plates and 1 text-figure.

Fowl Pest.

(337) LANDSTEINER (Karl) & BERLINER (Max). Ueber die Kultivierung des Virus der Hühnerpest. [The Cultivation of the Virus of Fowl Pest.]—*Centralbl. f. Bakt.*, 1. Abt., Orig., 1912. Dec. 4. Vol. 67. No. 3, pp. 165–168.

(338) MROWKA. Das Virus der Hühnerpest ein Globulin. [The Virus of Fowl Pest is a Globulin.]—*Centralbl. f. Bakt.*, 1. Abt., Orig., 1912. Dec. 11. Vol. 67. No. 4, pp. 249–268.

Leishmaniasis.

(339) BASILE (C.). Sur l'Identité des Leishmanioses et sur leur Mode de Transmission. [The Identity of the Leishmaniases (in Children and Dogs) and their Methods of Transmission.]—*Bull. Soc. Path. Exot.*, 1912. Dec. Vol. 5. No. 10, pp. 812–814.

(340) MARZINOWSKY (E. I.). Maladies Voisines de la Malaria en Russie, Kala-azar, Fièvre de Malte, &c. [Diseases related to Malaria, Kala-azar, Malta Fever, &c., in Russia.]—*Bull. Soc. Path. Exot.*, 1912. Dec. Vol. 5. No. 10, pp. 868–876. With 2 plates.

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(342) MARCHOUX (E.) & SOREL (F.). La Lèpre des Rats. (Second Mémoire.) [Leprosy of the Rat.]—*Ann. Inst. Pasteur*, 1912. Oct. 25. Vol. 26. No. 10, pp. 778–801.

Malaria.

(343) SINTON (J. A.). Some Attempts at the Cultivation of the Malarial Parasite by Bass's Method.—*Ann. Trop. Med. & Parasit.*, 1912. Oct. 18. Vol. 6. No. 3 B, pp. 371–373.

(344) THOMSON (J. G.) & MCLELLAN (S. W.). The Cultivation of one Generation of Malarial Parasites (*Plasmodium falciparum*) in vitro, by Bass's Method.—*Ann. Trop. Med. & Parasit.*, 1912. Dec. 30. Vol. 6. No. 4, pp. 449–462. With 2 plates and 2 charts.

Plague.

(345) Markl. Bakteriologische Diagnose der Rattenpest. [Bacteriological Diagnosis of Rat Plague.]—*Centralbl. f. Bakt.*, 1. Abt., Orig., 1912. Dec. 30. Vol. 67. No. 5, pp. 388–397.

Rabies.

(346) Manouélian (Y.). Etude des Corpuscles de Negri et des Formations Spéciales à la Rage à Virus Fixe. [The Nature of Negri Bodies and Peculiar Alterations found in Rabies caused by the Fixed Virus.]—*Ann. Inst. Pasteur*, 1912. Dec. Vol. 26. No. 12, pp. 973–985. With 2 plates.

(347) Porak (R.). Des Altérations fonctionnelles des Glandes Surrénales dans la Rage. [Functional Changes in the Suprarenal Bodies in Rabies.]—*Compt. Rend. Soc. Biol.*, 1912. Dec. Vol. 73. No. 35, pp. 601–602.

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(348) Hartley (P.). Report on the Preparation of Rinderpest Anti-Serum by Means of Diluted Virulent Fluids.—*Indian Civil Veterinary Dept. Memoirs.* No. 3. [Period covered 1910–1911.] pp. 231–241.

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(349) von Prowazek (S.). Einfluss hämolytischer Stoffe auf Spirochäten (Spironemacea). [The Effect of Haemolytic Substances upon Spirochaetes.]—*Centralbl. f. Bakt.*, 1. Abt., Orig., 1912. Oct. 12. Vol. 66. Nos. 5/6, pp. 424–426.

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(350) Carpano. La Febbre della Costa nella Colonia Eritrea. Note Biologiche e Morfologiche sulla *Theileria parva*. [East Coast Fever in the Colony of Eritrea. Biological and Morphological Notes on *Theileria parva*.]—*Clinica Veterinaria*, 1912. Nos. 19, 20, 21, 22.

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(353) Bevan (Ll. E. W.). Notes on a Strain of Human Trypanosomiasis and a Review of the Present Knowledge of the Human Trypanosomiasis of Northern Rhodesia and Nyasaland.—*Jl. Comp. Path. & Therapeut.*, 1912. Dec. Vol. 25. No. 4, pp. 298–312. With 6 text-figures and 1 chart.

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(355) Delanoë (P.) & Delanoë (Mme.). A propos du *Schizotrypanum cruzi*.—*Bull. Soc. Path. Exot.*, 1912. Oct. Vol. 5. No. 8, pp. 599–602. With text-figures.

(356) Kleine (F. K.) & Fischer (W.). Schlafkrankheit und Tsetsefliegen. [Sleeping Sickness and Tsetse flies.]—*Zeitschr. f. Hyg. u. Infektionskh.*, 1912. Dec. 20. Vol. 73. No. 2, pp. 253–259.

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(361) ——. A New Species of Hippobosca from Northern Rhodesia.—*Bull. Entom. Research*, 1912. Dec. Vol. 3. Pt. 4, p. 417.

(362) Carter (H. F.). Descriptions of Three New African Species of the Genus *Tabanus*.—*Ann. Trop. Med. & Parasit.*, 1912. Dec. 30. Vol. 6. No. 4, pp. 435–442. With 1 plate.

(363) Fell (T. E.). Notes on Tsetse-Flies and Prophylactic Measures against Sleeping Sickness in the Western Province of Ashanti.—*Bull. Entom. Research*, 1912. Nov. Vol. 3. Pt. 3, pp. 227–231.

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(365) Neave (S. A.). Notes on the Blood-sucking Insects of Eastern Tropical Africa.—*Bull. Entom. Research*, 1912. Nov. Vol. 3. Pt. 3, pp. 275–324. With 2 plates.

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(369) Brau. Parasitisme Intestinal du Porc de Cochinchine. [Intestinal Parasites of Pigs in Cochinchina.]—*Bull. Soc. Méd.-Chirurg. de l'Indochine*, 1912. Nov. Vol. 3. No. 9, pp. 585–587.

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Oestrides.

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(376) Fantham (H. B.) & Porter (Annie). Some Effects of the Occurrence of Myxosporidia in the Gall-Bladder of Fishes.—*Ann. Trop. Med. & Parasit.*, 1912. Dec. 30. Vol. 6. No. 4, pp. 467–481.

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